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VETERINARY MEDICINE

OCTOBER 1937

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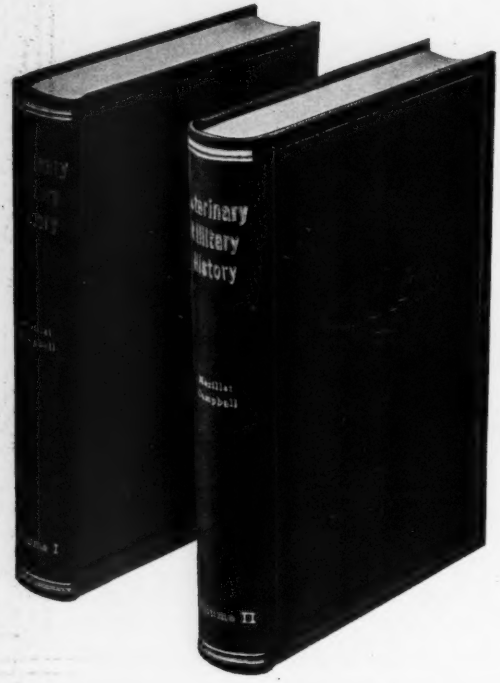
Chicago, U. S. A.

VETERINARIANS!

made this History;
Veterinarians wrote this History
All Veterinarians should read this History



Not to know what has been transacted in former times is to continue always a child. If no use is made of the labors of past ages, the world must remain always in the infancy of knowledge.—
Cicero

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D. M. Campbell, Editor A. T. Kinsley, Associate Editor
H. J. Mostyn, 1265 Broadway, New York, Eastern Representative

The 74th Annual Meeting of the American Veterinary Medical Association

Time: August 17-20, 1937.

Place: Hotel Fontenelle, Omaha, Nebr.

Attendance: Paid registration, 1370; total, 1476.

Weather: The expected, except it was pleasant the last day of the meeting.

Headquarters hotel: Inadequate in every respect from air-conditioning to service.

Clinic: Excellent.

Next meeting: New York, July 5, 6, 7, and 8, 1938.

New president: O. V. Brumley.

President-elect: H. D. Bergman.

International Veterinary Congress Award: To D. H. Udall.

Vice-presidents: First, John L. Tyler, Whittier, Calif.; second, Hugh E. Curry, Jefferson City, Mo.; third, M. E. Gleason, San Antonio, Texas; fourth, W. T. Spencer, Lincoln, Nebr., and fifth, Wm. H. Ivens, Philadelphia, Pa.

Treasurer: M. Jacob, Knoxville, Tennessee.

Member-at-Large of the Executive Board: C. W. Bower, Topeka, Kansas.

Chairman, Executive Board: H. W. Jakeman, Boston, Mass.

A good many members will be surprised to learn that the next meeting will be held the first week in July. Possibly the reason for this is to be found in the difference between New York and midwest climate. In the midwest it is practically certain to be hot in August. In New York, on the other hand, one has a reasonable chance of stifling weather in late June and in July, but it is quite likely to be pleasant in late August. Apparently the Executive Board and the House of Representatives hesitated to take a chance on holding a summer meeting when those attending might not be impressed with the fact that it was summer. Further, the July dates will probably be a convenience to some who will attend also the International Veterinary Congress five weeks later in Switzerland. The second week in September would serve those attending the international congress equally well and practically assure pleasant weather for the meeting.

Changes in Organization

It was decided to employ a business manager for the association to be added to the headquarters staff. The selection of the business manager and fixing of his status

and duties was delegated to a committee comprised of the president, the president-elect and the Chairman of the Executive Board.

Radio Program

The radio program, no mention of which was made in the official program of the association, comprised 15 broadcasts during the meeting. It is set down below in detail that a record of it may be available.

Over NBC Chicago, (64 stations): George R. Fowler, Iowa State College, Ames, Iowa, on "Recent Advances in Veterinary Science."

Robt. J. Foster, President 1936-37

Over Station WOW, Omaha: D. M. Campbell, Editor, Veterinary Medicine, Chicago, on "Veterinary Medicine Serves All the People;" The Hon. Robert Fechner, Director, Civilian Conservation Corps, Washington, on "Food Inspection in the CCC;" A. T. Kinsley, Director, Kinsley Laboratories, Kansas City, Mo., on "Horse Disease—Brain Fever of the Horse—Encephalomyelitis;" John R. Mohler, Chief, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C., on "Livestock Health, a National Asset," and Prof. R. R. Birch, New York State Veterinary College, Cornell University, Ithaca, N. Y., on "Veterinary Service and Public Health."

Over Station KFAB, Lincoln, Nebraska: L. A. Merillat, Chicago, on "Social and Economic Aspects of Veterinary Medicine;" P. V. Neuzil, Blairstown, Iowa, on

O. V. Brumley, President

"Veterinary Service to the Poultry Industry;" and H. D. Bergman, Head, Department of Veterinary Physiology and Pharmacology, Veterinary Division, Iowa State College, Ames, on "The preparation of Young Men for Veterinary Service."

Over Station KMA, Shenandoah, Iowa: C. M. Haring, University of California, Berkeley, Calif., on "Horse Disease—Brain Fever of the Horse—Equine Encephalomyelitis;" Hugh Hurst, Utah Poultry Growers' Association, Salt Lake City, Utah, on "Disease Problems of Poultry Growers," and E. C. Jones, Grand Island, Nebr., on "Anthrax—The Present Outbreak in South Dakota and Surrounding Territory."

Over WAAW, Omaha: O. V. Brumley, Dean, College of Veterinary Medicine, Ohio State University, Columbus, on "The Importance of the Veterinary Profession to the Live Stock Industry and the Citizens of the United States;" John S. Koen, B. A. I. force, Chicago, on "Veterinary Service," and R. M. Hofferd, Bu-

reau of Animal Industry Hog Cholera Control, Cedar Rapids, Iowa, on "Prevention of Swine Diseases."

President

Dr. O. V. Brumley, Dean of the College of Veterinary Medicine, Ohio State University, chosen president-elect at the Columbus meeting a year ago, was installed in the office of president at the close of the Omaha meeting. He has long been active in veterinary association affairs and a close observer of the work. He was ex-officio member of the Executive Board during the last year. He comes into the office of president well qualified to carry out the duties of that office.

President-Elect

Dr. H. D. Bergman will come into the office of president at the close of the New York meeting with a rich experience in the work of veterinary organizations. He has long been active in the Iowa association, being a secrtary of that association for a number of years, during which time its membership was built up to the largest of any state association and its importance to the state and its influence greatly increased. He is also a past-president of the Iowa association. He was an active member of the committee on Education of the A. V. M. A for five years and for an equal period, has been chairman of the Committee on Proprietary Pharmaceuticals. He has served acceptably on a number of other committees and had much to do with the work of the Committee on Local Arrangements for the 1924 meeting.

Herman Dale Bergman was born at Newton, Iowa, and was graduated from the Veterinary Division of the Iowa State College in 1910. Since graduation, he has taught continuously in the Department of Veterinary Physiology and Pharmacology, of which he is now head.

President's Address

The president at the Omaha meeting, Col. Robert J. Foster, broke a precedent of 75 years in the presidential address. Heretofore, it has been the custom of retiring presidents to recommend to the association such action as his experience in that office has convinced him to be advantageous. His suggestions are usually received with enthusiasm and referred to the Executive Board for consideration and never heard of again by the membership.

President Foster first made his recommendations to the Executive Board, which were thus brought before the association for action with its recommendations while the annual address was still fresh in mind.

Program

Forty-five papers were presented at the general sessions of the meeting. Abstracts of the more important of these papers follow:

H. D. Bergman

Cooperation Aids Veterinary Work and Cuts Costs[1]

The tremendous power and effectiveness of cooperation in veterinary enterprises received scientific endorsement from Dr. John R. Mohler, Chief of the U. S. Bureau of Animal Industry. He presented numerous examples showing that in addition

John R. Mohler

to other valuable qualities, a cooperative mental attitude is beneficial to both individuals and scientific organizations. Coordination of effort likewise gets things done promptly and economically.

Drawing on various fields of science and philosophical concepts, the speaker outlined why some persons are good cooperators and others are individualists. The majority, he explained, have varying degrees of the cooperative spirit. Doctor Mohler drew scientific analogies from breeds of live stock, which possess the herding instinct in greater degrees than others. He advanced the belief that in persons, also, heredity may be responsible, in part, for differences in willingness to work together. He suggested that veterinary and other professional organizations might advantageously select officers and committee members, at least partly, on the basis of their cooperative qualities. In support of this view he stated that record forms now in use for determining the efficiency of Federal employes include a rating of their cooperative tendencies.

The speaker cited historical events illustrating how varying degrees of cooperation among scientific pioneers and their associates have hastened or retarded human progress. He paid tribute to individual initiative, but urged that this quality, to be most productive, must be combined with a courageous, optimistic and public-spirited attitude. In conclusion, Chief Mohler advised that criticisms from any source be analyzed and that any constructive elements found be turned to good account.

The Chief was apparently chiding someone, possibly some of those engaged in the cooperative Bang's disease project; but the individuals, if any, that he had in mind were not apparent to his audience, although doubtless recognized by themselves.

[1] By John R. Mohler, Chief, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C.

* * * *

Dietary Deficiencies and Related Symptomatology in Domestic Animals[2]

Advancing knowledge has caused us to recognize more clearly the importance of feeding in the well being of domestic animals. Great discoveries made in the pure biological science laboratory with the vinegar fly, white rat or guinea pig as the test animal ultimately reach the ken of those called upon to advise regarding abnormalities in animals. Nutrition is a very involved field of knowledge with new facts being uncovered constantly and the end not in sight. The highly artificial conditions under which our animals are maintained in fenced enclosures and fed more and more the by-products of industry render them far removed from natural conditions. Nutritional deficiencies must therefore take their place along with bacteria, parasites and hereditary defects in the broad differ-

[2] By Geo. H. Hart, University of California, Davis, Calif.

entiation of abnormalities encountered in the various species.

Bone diseases such as rachitis in puppies and osteomalacia in cattle are associated with calcium and phosphorus intake, the ratio between them, and vitamin D. Osteomalacia is a condition in adult animals similar to rickets in young ones but is not so well understood. It is frequent in dairy cows in some sections where it is commonly known under the name of creeps.

Cassius Way

Iron, copper, cobalt and manganese are associated with anemia particularly liable to occur in young nursing pigs kept on board or cement floors thus depriving them of access to iron containing soils.

Iodine shortage in certain quite well delimited areas of the country results in the birth of dead or weak, hairless or goitrous offspring. The lack of minimum quantities of vitamin A causes a great variety of symptoms and heavy financial loss in some seasons when green feed is not available for a period sufficiently long to exhaust the animals' reserves of this vitamin.

Poultry are particularly susceptible to vitamin deficiencies. Polyneuritis is the condition in fowls that caused vitamin B to be discovered. This water soluble substance is known to contain a number of factors. Vitamin G is the thermo-stable factor that may be separated from it by heat. The lack of vitamin G is associated with the particularly fatal malady in dogs known as black tongue, now prevented or cured by the proper administration of this substance.

Evidence exists that one particular value of dairy by-products such as skim milk and whey in hog rations may be due to their content of water soluble vitamins.

Secondary dietary essentials, a general term including minerals and vitamins, are thus seen to be associated with the causation of very important abnormalities in livestock.

* * * *

Equine Arthritis[3]

Arthritis is one of the oldest diseases known to animals and man. Fossils of animals that lived at least 600 million years ago (the Miocene period) show definite lesions of the disease. Arthritis or rheumatism is one of the most serious diseases affecting the human family, possibly causing more worry, anxiety and suffering than any other single disease. In horses the greatest cause of inefficiency is lameness. The group of diseases commonly known as "bone diseases" and more specifically called "spavins," "ringbones," "side bones," "splints," etc., is the most common factor in the cause of lameness in horses.

There is much difference of opinion regarding the etiology and the exact nature of arthritis. For those who believe in the calcium-phosphorus-unbalance theory there are many supportive arguments. For those believing in dietary, vitamin and similar theories there are also many more or less convincing points. Likewise for those believing in the bacterial or infection theory there is much data to support their contentions. Suffice it to say, however, that in well nourished horses there is very little lameness, very little arthritis and very little evidence of common bone diseases among horses that do not work hard and are not subject to trauma and strain. The writer believes this conclusion is especially justified in the heavy breeds that put in "long days" at farm work or heavy trucking as true "beasts of burden." Among the lighter breeds of pleasure and sport horses this is especially true of the Thoroughbred, the trotter, the polo pony and the hunter. These horses when they are able to perform their duties really work hard. The strain and trauma exerted on the joints and bones of the limbs is often excessive. Strain and trauma precede inflammation which in turn may cause an ideal condition in the tissues

[3] By Cassius Way, New York City, N. Y.

for various types of bacteria both specific and non-specific to live and give off the product of their growth and development.

In the writer's opinion in listing the causes of equine arthritis *trauma* should occupy first place and bacterial *infection* together with its products of growth and development should occupy second place.

R. R. Birch

Doctor Birch discussed "Veterinary Service and the Public Health" in a broadcast over station WOW.

In human arthritis it is generally conceded by those qualified to speak that the digestive tract is the main source of trouble. In equine arthritis we have a perfect analogy. From the tonsils of most horses we may recover at almost any time the organism that is so common in most fatal cases of "navel-ill" in foals. In other parts of the alimentary tract we find a "thousand and one" varieties of organisms—streptococci, staphylococci, bacilli, and all the rest. But, you ask, how do they get from the digestive tract to tissues adjacent to the hock or fetlock or other joints to cause rheumatoid arthritis? The answer is—"by the simplest route in the world"—by the multitude of intestinal parasites that continually migrate from the digestive tract to remote parts of the body. In other words, every parasite carries "on his back" his full quota of bacteria. To the writer the cycle is quite definite; trauma—inflammation—bacterial invasion—rheumatoid arthritis—lameness—osteo-arthritis—bony deposits and permanent bone abnormality.

Recommendations for the treatment of arthritis are as old as time. To list and briefly describe the multitude of nostrums that have been recommended one would have to talk as fast as possible twelve hours a day for over one year. The disease is increasing—progress in its treatment and control seems to be "slowly backward." There seems to be "reverse English" on the ball. However, during all these years we have learned *much*. In human medicine the successful treatment of arthritis by specific bacterial antigens or bacterins the specificity of which was first determined by complement fixation test of the blood to many strains of organisms recovered from lesions of disease, from digestive tracts, from nasal passages, from tonsils, teeth and genito-urinary tracts has received much impetus and approval. This method and principle of treatment of equine arthritis has been applied by the writer to some of the best horses in training among Thorobreds, trotters, hunters, saddle horses and polo ponies. The results have been most satisfactory. In the treatment of almost all diseases old time methods and superstitions have long since "gone by the board." What about hog cholera? What about milk fever? What about rabies? What about typhoid, scarlet fever, diphtheria and dozens of others that might be mentioned? You all know the answer but what about arthritis?

In human medicine 300 years ago—200 years ago—yes, 100 years ago, physicians used to fire and blister patients for various ailments including arthritis just as *we* do today. They have long since given up that practice.

A properly balanced diet with special reference to calcium and phosphorus, the systematic treatment of bacterial invaders, a better knowledge of blood chemistry and metabolism will aid much in our progress in the treatment of arthritis.

I shall probably not live to see it, probably most of us older men will not, but our younger brothers may, our nephews and children may, but surely our grandchildren will live to see the day when

equine arthritis is treated just as scientifically, just as efficiently, just as humanely, as human arthritis is today. Would that owners of animals could see the parallel between human disease and comparable disease in animals, they would then rise up and demand modern scientific treatment, then the profession would rise to the occasion, as it always has in the past, and find the way.

Moldy Corn Poisoning in Horses[1]

Serious losses have resulted from time to time due to feeding toxic corn to horses. This condition has been recognized for years. The losses are by no means limited to one particular locality. There are some other diseases of horses in which the central nervous system is involved in which the clinical symptoms are similar and in some cases identical to moldy corn poisoning. There has been considerable confusion developing in the minds of the practioners recently regarding certain factors and pathologic changes which make it possible to differentiate some of these conditions.

For the past two years during the winter and spring many cases have been brought to our attention which manifested symptoms indicating a severe central nervous disorder. The majority of these cases were diagnosed clinically as the specific virus encephalomyelitis. Examination of the brains of these horses showed no evidence of the virus disease. Microscopic examination failed to reveal any pathologic changes characteristic of the virus disease. Furthermore, all attempts to demonstrate the presence of virus by experimental inoculation of animals failed. The brain tissue of these horses invariably showed various degrees of degeneration and liquefaction necrosis which were confined to the white substance of the cerebal hemispheres. Numerous other cases reported by veterinarians throughout the state occurring at this time of year, showing the same clinical symptoms, revealed similar pathologic changes in the brain tissue.

[1] By L. R. Schwarte, Veterinary Research Institute, Iowa State College, Ames, Iowa.

A carefully controlled experiment was carried out in an effort to reproduce this condition by feeding moldy corn of known toxicity.

Five horses were placed in a dry lot and

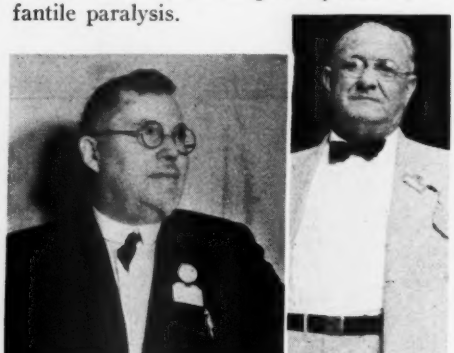
I. A. Merchant
Secretary, Section on Sanitary Science and Food Hygiene.

fed moldy corn and a good grade of corn fodder. Three horses used as controls were fed clean corn and corn fodder. All of the horses fed moldy corn developed well defined clinical symptoms. Those which died showed extensive brain lesions, namely, edema, hemorrhage and liquefaction necrosis in the white brain matter. The majority of these necrotic areas were yellowish-orange in color and of a creamy consistency. The control horses which were fed clean corn and corn fodder failed to develop any clinical symptoms or any untoward response. They were released in good condition after the close of the experiment.

Brain tissue of the experimental horses which either died or were destroyed after showing well defined symptoms were negative to bacterial and virus tests.

The difficulty of selecting suitable names by which we may instantaneously associate a certain definite pathologic condition caused by a specific etiological factor, has been recognized for many years. The condition now being discussed has been desig-

nated tentatively as moldy corn poisoning in horses. This at once differentiates it from the specific virus encephalomyelitis and other conditions which may be found to produce symptoms characteristic of a central nervous disturbance. It seems that equine encephalomyelitis should be reserved for the specific virus disease because it is quite comparable to the specific virus disease in man known as poliomyelitis or infantile paralysis.

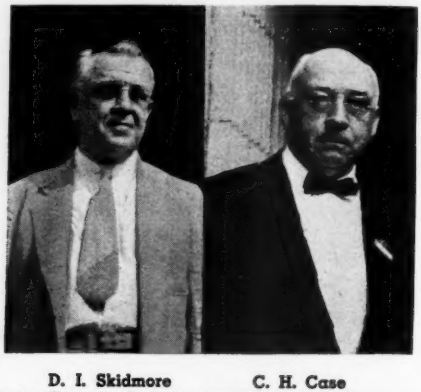


A. T. Kinsley **L. A. Merillat**
Doctor Kinsley broadcasted an address on the "horse disease" over WOW.
Doctor Merillat discussed "Social and Economic Aspects of Veterinary Medicine" in a broadcast over station KFAB.

The seasonal occurrence and the history of the case may be guiding factors to the practioner in making a differential diagnosis. Moldy corn poisoning usually appears in Iowa in November and continues through the winter months even as late as May, during which time the virus disease has subsided. It is possible, however, to have an overlapping in the occurrence of these two diseases in October and November, depending on the temperature and rainfall affecting the development of the corn. The specific virus encephalomyelitis is seldom encountered later than two weeks following the first killing frost. In moldy corn poisoning, the symptoms manifested depend on the extent and location of the lesions in the brain. The course depends on the toxicity and quantity of the corn consumed and the tolerance of the individual.

Pathologic changes associated with moldy corn poisoning include necrosis, edema, definite hemorrhage and degenerative processes. On the other hand the pathologic changes associated with the specific virus encephalomyelitis are perivascular infiltration, focal infiltration, invasion and destruction of the nerve cells by the leucocytes. Bronzing of the nerve cells is often observed. Considering the seasonal occurrence and history of the case with the pathologic changes described, it is possible to differentiate the virus disease from moldy corn poisoning.

The practitioner is often called upon to



D. I. Skidmore **C. H. Case**
Doctor Case conducted a mastitis control demonstration at the clinic that was one of its most popular features.

treat horses suffering from moldy corn poisoning. There is no specific therapeutic agent known up to the present time which is effective in relieving this condition. The horses should be removed from the field, or if fed in the barn should not have access to toxic feed. A laxative is indicated to eliminate the toxic material ingested. A light feed of bran and good hay should be continued for some time after improvement is observed. The animal should have access to fresh water at all times. In advanced cases, the removal of the stomach contents is indicated. Water may be administered as indicated by means of a stomach tube until the animal is able to drink. In order to prevent losses from this cause it is necessary to eliminate the possible consumption of toxic corn. Some clients who have experienced losses from this condition no longer allow their horses to run in the

cornfield. They also provide muzzles for their horses in the field during the harvesting of their corn. These clients have had no further trouble.

* * * *

Intravenous Use of Sodium Iodide in Actinomycosis[5]

Actinomycosis is one of the most prevalent conditions encountered in cattle practice in the West. The economic loss from this condition is incalculable.

"Actinomycosis" is here used in the broadest clinical sense of the term. Our newer knowledge of what has been regarded as actinomycosis as an entity now also embodies actinobacillosis. Generally speaking, actinomycosis causes more or less of a chronic suppurative osteomyelitis resulting in destruction and rarefaction of bone; whereas, the infection of soft tissues, such as the lymph glands, skin, vulva and mammae is generally actinobacillosis.

Potassium salts injected intravenously are dangerous, sodium salts are much less toxic and can be tolerated far beyond the physiological need of the body. With these facts taken into consideration, it was deemed safest to use sodium iodide intravenously.

For the past four or five years we have been using sodium iodide intravenously in the treatment of actinomycosis and actinobacillosis. We can report that it is much superior to any of the older methods of treatment. The dosage is gauged according to the weight. Animals weighing 1000 pounds are given one ounce of sodium iodide dissolved in one pint of sterile distilled water. Those weighing 1500 pounds are administered one and one-half ounces in the same amount of water. Those weighing approximately 500 pounds should be given four to six drams of sodium iodide. Young animals seem to tolerate relatively larger doses. The dosage for animals between these weights should be proportionably the same.

The method of administration is with any intravenous outfit given into the jugular vein using a 16-or 18-gauge needle. It should be given slowly and care must be exercised, particularly toward the termination of the injection to watch for a systemic reaction. This is manifested by slightly increased restlessness, increased respiration and heart action, occasionally lacrimation, and apparent vertigo. If this appears further administration should be stopped immediately. Probably less than 5% of animals so treated will show such a reaction. There are no unfavorable results if such a reaction does occur, and no deaths have been experienced from its use. Animals debilitated from extensive lesions withstand treatment equally as well as strong individuals.

James Farquharson

Animals treated in this manner do not show symptoms of iodism. A very small number so treated may show slight impairment of appetite for about two days. Milk cows may show a very slight decrease in lactation for about the same period and pregnant cows usually abort.

In cases where abcesses are so large as to mechanically cause impaired function, it it best to drain them along with the intravenous medication. The decrease in the size of the tissues involved is far more rapid and certain than with the use of potassium iodide orally. Snoring due to deep-seated pharyngeal abcesses, and which is usually accompanied by pronounced dyspnea, shows rapid amelioration for two or three days when the symptoms disappear. Woody tongue is relieved in 24 hours so that the animal can eat and drink. There is a much higher percentage of permanent cures from the intravenous use of sodium iodide than from other methods or the administration of potassium iodide. One treatment is usually sufficient in soft tissue lesions.

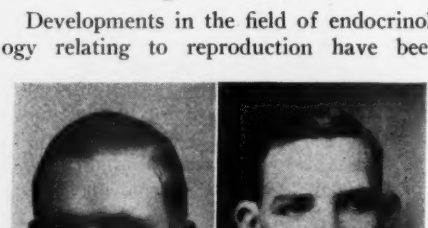
Bone lesions should be treated surgically by trephining or any other convenient

[5] By James Farquharson, Colorado Agricultural College, Fort Collins, Colo.

method and the soft bone removed with a curette. This is accompanied by the intravenous use of sodium iodide. Invariably the process is arrested and a remarkable dimunition in the size of the bone will result. A second intravenous injection is recommended in 10 to 14 days.

Endocrines and Their Role in Reproduction[6]

Developments in the field of endocrinology relating to reproduction have been



L. H. Scrivner, (Page 454) W. G. Venzke

enormous and rapid during the past decade. Differences in interpretation, conflicting findings, and deficiency of information will make it apparent why some report of research progress rather than final solutions characterize this presentation. The presentation includes a brief discussion of the site of production, physiological function, and interrelationships of hormones concerned in reproduction.

The observation of the effects of the removal of a gland of internal secretion is generally the most important step in the elucidation of the gland's function. Removal of the pituitary body produces atrophy of the reproductive system in the male and female rat. In the female rat, atresia of all follicles in the ovary and an abnormal persistence of corpora lutea occur. Parturition can occur in hypophysectomized rats, but the uterus is said to be less sensitive to the oxytocic principle of the posterior lobe. Gonadal function can be restored after hypophysectomy in male and female rats by hypophyseal implant treatment.

Two types of gonadotropic substances have been prepared from the anterior hypophysis. One of these, if injected into a female, produces follicular stimulation; the second fraction which has not been satisfactorily purified, produces luteinization. The follicular stimulating fraction from the hypophysis injected into hypophysectomized male rats will produce a response in the seminiferous epithelium of the atrophied testes. If the luteinizing fraction is injected into a similar rat, an extensive interstitial tissue hypertrophy results.

It has been suggested that the production of ovulation in immature rats may depend upon a proper balance of follicular-stimulating and luteinizing activities and if an excess of the latter is effective, rapid luteinization will entrap the ova within the Graafian follicle.

Hypophysectomy technic in the rat quite conclusively established that thyroid activity is dependent upon the stimulating action of the pituitary. The thyroid exerts an influence on follicular activity. Feeding of desiccated thyroid daily to pregnant rats produces resorption of the feti in some animals; in other cases abortion or a prolonged gestation period with ultimate delivery of dead young. Thyroid administered to non-pregnant rats in comparable doses produced a diestrus condition after two estrus cycles, which was maintained as long as treatment was continued.

The parathyroid glands are concerned with calcium metabolism. It is known that the fetus consumes a large amount of calcium and phosphorus from the mother during gestation and lactation. Perhaps the parathyroid and accessory parathyroid glands assist in meeting these demands.

Hypophysectomy in rats results in a marked atrophy of the adrenal cortex. Homoplastic pituitary implants restored the cortex to normal size and appearance. No marked effect on the medullary portion of the adrenal gland has been described fol-

[6] By W. G. Venzke, University of Wisconsin, Madison, Wisc.

lowing hypophysectomy. Adrenalectomized female rats seldom become pregnant. Pregnant animals which have been adrenalectomized fail to go through the normal process of parturition, abortion is frequent, and lactation fails to follow. Adrenalectomized male rats show reduced fertility. Evidence is reported for the presence of a second hormone in the adrenal cortex, "cortilactin," which is essential for lactation in adrenalectomized animals. Maintenance of the salt balance in the adrenalectomized animal has been shown to be the only essential necessary for lactation.

A lactogenic principle has been prepared from the anterior hypophysis. Lactation cannot continue in the hypophysectomized animal. The lactogenic principle acts on fully developed mammary tissue to initiate and excite milk secretion.

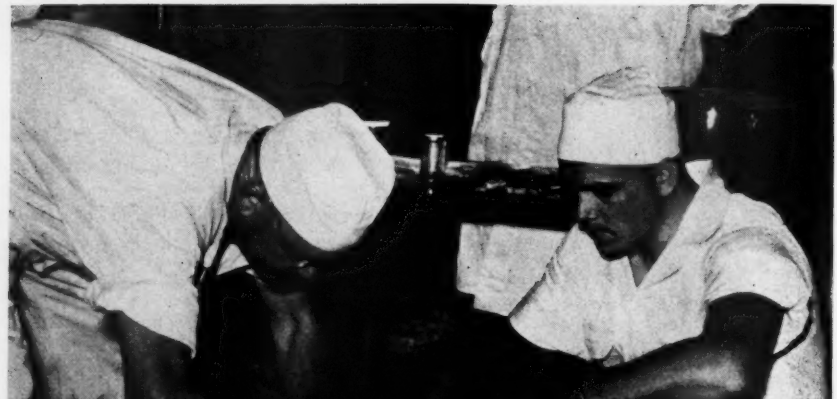
Two fractions named "pitressin" and "pitocin" from the posterior lobe of the pituitary have been prepared and quite highly purified. Pitressin exerts physiological action on the renal, cardiovascular, respiratory, and intestinal systems. White rats of the Wistar Institute strain injected daily intraperitoneally through successive generations of the parents, produced in the third and succeeding generations of young, rapid development physically, sexually, and psychically. Pitocin produces an oxytocic action.

Ovariectomy before puberty results in complete failure of the accessory glands to undergo their normal development. Postpubertal ovariectomy results in cessation of all cylic activity in the uterus, vagina, and mammary glands, and slow degeneration of the reproductive organs.

The collective term "estrogen hormones" includes these substances which have the ability to produce estrus. Estrogenic hormones were originally obtained from ovarian follicles, but have since been found in the placenta and the urine of the pregnant human female, urine of stallions, pregnant mares and pregnant cows.

Estrogenic substances have many physiological functions. Certain secondary sex characters in the female are dependent upon the presence of estrogenic substances. Oestrin injected into the normal pre-pubertal rat or mouse produces rapid proliferation of the vaginal epithelium and opening of the vagina. Proestrus changes in the anestrus dog can be produced by oestrin injections. Early stage pregnancy can be interrupted in the rat by injection of estrus-producing hormones. In the normal mouse and rat the injection of oestrin after copulation leads to the return of estrus symptoms, and failure of embryo implantation. Estrogenic substances are responsible for growth of the mammary gland ducts and alveoli in the guinea pig. Progesterone, the corpus luteum hormone, following the action of theelin has been found necessary to produce complete mammary growth in the other species of mammals. The mating instincts appear to be partly dependent on the ovarian follicular hormones.

After the follicle in the ovary ruptures and the ovum begins its journey down the fallopian tube, a transitory endocrine gland, the "corpus luteum" develops in the cavity of the ruptured Graafian follicle. The corpus luteum sends into the blood stream a substance called "progesterone" that has the property of producing extensive development of the uterine glands known as "progestational proliferation." The uterus must first react to estrogenic substances before the corpus luteum hormone can produce progestational changes. Decidual growths can be produced only in the presence of functional corpora lutea. Removal of the corpus luteum in the early part of the gestational period in many species produces failure of implantation of the embryo, or, if the embryo has already been implanted, it produces abortion. In some species the presence of a corpus luteum throughout the gestation period is not necessary. Ovulation is suppressed by persistent corpora lutea. A premenstrual condition can be produced in the endometrium of the *Macacus rhesus* castrate by injections of corpus-luteum extracts. Rabbits injected with corpus luteum extracts show a temporary cessation of spontaneous uterine contractions. Mammary growth during



Suturing the abdominal incision after a cesarean section on a cow in the clinic at the Omaha meeting of the A. V. M. A., August 20, 1937.

pseudo-pregnancy is dependent upon corpora lutea.

Another substance, distinct from progesterone, has been found in the corpus luteum extract and is called "relaxin." This preparation, following the action of theelin, has the property of relaxing the symphysis pubis in the guinea pig.

The testicular hormone exercises its influence on the accessory glands of reproduction of the male.

The urine of pregnant women contains a gonadotropic hormone termed "prolan." The blood of mares in certain stages of pregnancy contains large amounts of gonadotropic hormone. From a practical standpoint, the discovery of gonadotropic hormone in the urine and blood has offered a reliable method for the early diagnosis of pregnancy. Prolan is considered by some to be a mixture of two gonadotropic hormones, "prolan A" and "prolan B." "Prolan A" stimulates chiefly the growth of the Graafian follicle. "Prolan B" produces "luteinization" of the granulosa and theca cells of developing mature follicles. "Prolan A" has been secured only from the urine or blood of non-pregnant, castrate or meno-

pause women. Gonadotropic hormone occurring in the blood of pregnant mares produces effects different from those characteristic of prolan, but resembling those of the anterior pituitary. Prolan from pregnancy urine injected into immature male rats stimulates interstitial tissue with secondary effects on the accessory reproductive organs. Prolan A injected into immature rats produces a stimulation of the seminiferous tubules. Gonadotropic hormone has been found in cases of hydatidiform mole and in uterine chorionepithelioma and appears to be identical with prolan or a fraction "B" of prolan. A similar hormone is excreted by men with malignant tumors of the testis.

The placenta stores or elaborates three principles: Theelin, emmenin (Collip), and the anterior-pituitary-like principle (Collip). Oral administration of emmenin produces estrus in immature rats in from three to five days. Emmenin differs from theelin in lack of effect on the adult castrate male and female and ability to produce an effect on the immature animal by oral administration. The anterior-pituitary-like (A-P-L) principle acts similar to the gonad-controlling principle of the anterior pituitary gland.

Therapeutic application of hormone preparations to endocrine disturbances is not well understood at the present time. There is much we do not know about hormonal action, standardization, and administration of extracts to give the effects desired. Therapeutic application with hormone preparations to reproductive disturbances of an endocrine nature have given variable results. At the present time therapeutic use of hormones is still in an experimental stage, successes from their use on animals affected with reproductive disturbances of an endocrine nature are generally a result of chance rather than result from application of established facts. From a clinical point of view, greater control over the results derived from treatment will be obtained, as more knowledge is gained by a systematic study of endocrine disturbances.

Some Results From the Vaccination of Cattle With Brucella Abortus, United States Bureau of Animal Industry, Strain 19[7]

Vaccine prepared from strain 19 was used in doses of 100 to 300 billion living organisms on 93 heifers and 4 cows in a dairy herd affected with brucellosis.[8] For a period of four years the results have been beneficial. The immediate shock of the vaccination is apparently more pronounced in mature animals. No injury resulted from the vaccination of 3 heifers while they were in the third month of gestation. Vaccination during advanced pregnancy of a cow kept in isolation brought about a typical brucellosis, with death of the fetus and discharge of large numbers of the organisms of strain 19 in uterine material at the time of parturition.

At the time vaccinations were started in 1933, the herd contained 43 milking cows, 13 of which proved to be shedding virulent *Brucella abortus* in the milk. These were permitted to remain in the herd, and for the first three years the only criterion for removal of an animal was low milk production. Thereafter, 8 of the original 13 shedders still remained in the herd, 7 of which proved to be still discharging the organism in the milk. None of these had been vaccinated. They were recently removed and tests now indicate that the herd may be free from shedders. At present, the herd consists of 65 cows, 49 of which have been vaccinated. Ten animals with an agglutination titer of 100 or above still remain in the herd, and further tests over a period of several months must be made before concluding that the herd is free from brucella infection. No evidence was obtained that the injection of strain 19 into non-pregnant heifers produced more than a temporary bacteremia. The association of vaccinated with non-vaccinated cattle did not result in any apparent spread of brucella infection to the latter. As a

[7] By C. M. Haring, University of California, Berkeley, Calif.

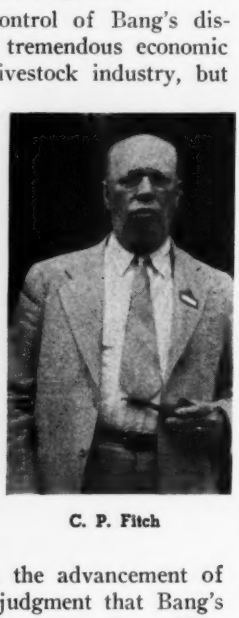
[8] This investigation was supported, in part, by funds allotted by the United States Bureau of Animal Industry for the study of abortion in cattle.

result of association with the old, infected, non-vaccinated cattle, one of the vaccinated heifers shed virulent *Brucella abortus* (not strain 19) in the uterine material at the time of her first calving. She gave birth to a full-term, vigorous calf and her agglutination titer remained negative. Another heifer, apparently as a result of infection previous to her vaccination, has shed virulent *Brucella abortus* (not strain 19) in the milk, after three normal parturitions in which she produced vigorous calves.

Bang's Disease From a Practitioner's Viewpoint[9]

Prevention and control of Bang's disease is not only of tremendous economic importance to the livestock industry, but

S. L. Stewart



C. P. Fitch

is also significant in the advancement of breeding. It is our judgment that Bang's disease is primarily an economic problem rather than one of public health. It is a problem that concerns chiefly the veterinary profession and the livestock industry. The public is interested in Bang's disease in cattle primarily as a health problem, but certainly the danger to the public is minor when compared to many other diseases, especially those of the throat, stomach, and bowels, which may be caused by the consumption of milk from dairy cows affected with other than Bang's disease, particularly cows affected with some varieties of mastitis.

Since, with few exceptions, only sexually mature individuals contract either undulant fever or Bang's disease and children and calves possess a natural resistance, to the disease, it would seem that there is yet much to be learned about transmissibility of these diseases. Why some persons contract undulant fever and others who are continuously exposed do not, and how to trace the source of the infection is yet a problem.

It is the duty of every veterinarian to safe-guard the livestock industry as they are the guardians of livestock health. Veterinarians should use their professional and political influence to discourage the plan of slaughtering all positive reactors, some of which may be of high producing value. Some positive reactors will be negative on the next blood test. This is especially true in some dairy cattle that do not associate with hogs.

At the present time only two methods of controlling Bang's disease are available. One is by the agglutination test and segregation of positive reactors, that is, the two-herd plan, or slaughter of all reacting cattle. The disadvantages of this plan is now being earnestly discussed by many cattle breeders as well as veterinarians. The question arising in their minds, is this plan alone financially justifiable? The other method is vaccination with a live culture vaccine of all good cows in an infected herd, both positive and negative reactors.

Vaccination with live culture vaccine, of pregnant cows only, has given good results. It has not been 100% effective in all of the herds vaccinated. Vaccination of infected herds has as a whole been about 95% perfect following the first vaccination and a 100% calf crop has been obtained after removing sterile cows and revaccination of the cows that did abort. The past four years all positive cows that have aborted in a vaccinated herd have been vaccinated two to three times during the

[9] By S. L. Stewart, Olathe, Kans.

next period of pregnancy. The percentage of abortions after vaccination has dropped to about 4% in the last four years. This is attributed to the present method of handling and vaccination of infected herds.

In closing, I wish to say that while I believe in blood testing where it is indicated, and think it is extremely valuable in diagnosing the disease, I wish to emphasize that I am a firm believer in the use of live culture vaccine in controlling and preventing Bang's disease, and thus saving all good producing cows and bulls for the cattle industry, and in using our influence toward proper disposition of non-profitable cows and bulls.

* * * *

A Study of the Vaginal Content of Pregnant Cows Infected with Bang's Disease[10]

The gravid uterus and the udder of cows infected with Bang's disease are the organs most often invaded by *Brucella abortus*. It has, however, been demonstrated by Schroeder and Cotton, Birch and Gilman, and Doyle that this organism may be found in other localizations in the animal body, especially in the lymph glands. This latter localization does not favor the spread of the disease as it would in organs from which discharges or secretions are eliminated directly outside of the animal body.

The fact that *Brucella abortus* is often found in the gravid uterus of Bang infected cows suggests the possibility that this organism may be discharged from the uterus prior to calving or aborting. In healthy cows the cervical canal is well sealed from 30-40 days after conception and the mucus forming this seal is apparently very effective in keeping bacteria from entering the normal pregnant uterus. Fitch and Bishop in a study of 86 pregnant uteruses found the fluids and tissue free of bacteria.

A total of 440 examinations of swabs taken from the vagina have been made of 58 reacting animals. Of this group only seven samples were positive for *Brucella abortus*. Five of the positive samples were taken within 24-48 hours before parturition and after the uterine seal had broken. One sample taken 21 days before parturition was positive, however, samples taken from this same cow 10 days and another 48 hours before parturition were negative. *Brucella abortus* was isolated from the placenta of this animal at calving time. Another sample taken 25 days before calving from a second animal was found to be positive. Samples taken 18 days, 10 days and 48 hours before calving from this same animal were all negative. The guinea pigs inoculated with the placenta from this animal died within a few days after inoculation. *Brucella abortus* was not isolated from the pigs or from direct cultures of the placenta.

The evidence that *Brucella abortus* is not found in the vagina prior to calving or aborting after the uterine seal is broken far outweighs any evidence to the contrary. The two positive samples obtained when the uterine seal was intact out of a total of 440 would indicate that they might have been contaminated with feces or urine. It should be understood that these studies were made on animals not showing noticeable discharges from the vagina. Animals showing such discharges might be exceptions.

Summary

1. 440 examinations were made of the vaginal content of 58 cows reacting to the agglutination test for Bang's disease. *Brucella abortus* was found in two examinations before the seal of pregnancy had broken.

2. *Brucella abortus* was isolated from the placentas of 20 of the above animals showing an active uterine infection. Eleven of these animals aborted and nine calved at full term.

3. Forty-six animals calved at term and *Brucella abortus* was isolated from the placentas of 20% and from the colostrum of 77% of such animals.

[10] By C. P. Fitch, W. L. Boyd, and Lucille M. Bishop, University of Minnesota, St. Paul, Minn.

The Hon. Robt. Fechner

4. These studies indicate that *Brucella abortus* is not ordinarilyfound in the vagina of pregnant cows, infected with Bang's disease, until very shortly before an abortion or a normal parturition. This organism, however, appears in the discharges after the seal of pregnancy is broken.

* * * *

A Study of Hemorrhagic Septicemia Bacterin and Bang's Disease of Cattle[11]

Kitselman and Lienhardt studied experimentally the blood serum of cattle which had been injected subcutaneously with hemorrhagic septicemia bacterin, in relationship to the Bang agglutination test. It was found that while cattle injected subcutaneously with hemorrhagic septicemia bacterin gave rise to agglutinins for Pasteurella organisms, they do not give rise to agglutinins for Brucella organisms. Sera from these animals, therefore, do not cause a reactive titer in cattle even though they be injected with large doses of hemorrhagic septicemia bacterin.

In another experiment in which abortus Bang reacting cows were given hemorrhagic septicemia bacterin subcutaneously, the Bang-titer of these cows was not lowered from a positive to a negative level during the six-month period of observation.

[11] By C. H. Kitselman and H. F. Lienhardt, Kansas State College, Manhattan, Kans.

Food Inspection For the Civilian Conservation Corps[12]

Since 1933 the CCC has given employment to approximately two million people. The federal government takes painstaking care to build up and to safeguard the health of the young men enrolled in the CCC by making certain that the food served in the camps is pure, wholesome, and nourishing. Supplying ice and fresh and perishable foods to the CCC camps, which in the less densely populated areas may be as much as 75 miles from the nearest railroad point, presented a difficult problem. These difficulties of food supply have been surmounted by careful methods of purchase, inspection and transportation. After careful and exhaustive studies it was decided that the Army "garrison ration" with but slight alteration would supply an adequate, balanced, and economical diet for the men of the corps. The CCC ration allowance is based not only upon definite quantities of the various ration items, but upon a specified quality of each. It is apparent that the quality of meals served in the CCC is in a very large measure based on the efficiency of the food inspection service.

Each enrollee requires slightly in excess of five pounds of food daily; of this amount there are approximately two pounds of animal origin. Though these foods represent but 40% of the weight of the ration, they account for 60 to 70% of the cost, and an even higher percentage of the food value. In the field of sanitary inspection of foods of animal origin the veterinarian stands preeminent; by virtue of his professional training he should also be fitted to become the most competent in general quality inspection.

The isolated location of many of the camps made it impracticable to have the regulations of the Bureau of Animal Industry apply to meat purchased for the CCC; it was, therefore, necessary to purchase meat from plants where the slaughtering was not inspected by the Bureau of

[12] By The Hon. Robert Fechner, Director, Civilian Conservation Corps, Washington, D. C.

Animal Industry, as part of its regular work. Consequently, arrangements were made to have the Veterinary Corps of the Army assume responsibility for inspecting all food products of animal origin, used by the CCC. The veterinary officer makes his inspection chiefly at the plants of contractors in the market centers within the district to which he is assigned. He inspects and maintains sanitary supervision of all dairies and milk plants that supply the camps within his district. Purchases are limited to establishments that meet the exacting requirements of the sanitary regulations of the army. Because the Veterinary Corps of the Regular Army was inadequate in numbers to perform these additional duties veterinary reserve officers were ordered to active duty and assigned to this duty. From 100 to 115 such officers have been required for this work.

The problem of a sanitary and safe milk supply has been one more or less peculiar to the CCC in many districts. In this respect the Veterinary Corps has done more to carry the gospel of milk sanitation to rural communities where it was most needed, than has any other single agency.

So successful has the veterinary service proved itself in the field of sanitation and quality grading of foods of animal origin, that in many areas the district commanders have requested that its activities be extended to include the inspection of other foods, of fresh and canned fruits and vegetables, and other items, such as bread.

The value of the veterinary inspection cannot be wholly measured in dollars and cents. No monetary value can be placed on the improvement of physical welfare, the prevention of human disease, or the preservation of human life, which ends are being accomplished by proper sanitary inspection. The savings made by quality grading inspection, however, can be estimated quite accurately. Insanitary and unsound products which in the absence of inspection would have been accepted, would have been a complete loss to the government. Rejections made for these reasons, computed as savings to the government at full contract price, amounted to nearly one million dollars, more than twice the actual cost of inspection, leaving a net saving of one-half million dollars to the government. Stated in another way the cost of inspecting these perishable and semi-perishable foods is about 1 1/3% of the cost of the food.

Not evaluating the all-important item of disease prevention, the veterinary inspection service is a profitable, sound business investment which pays 100% dividends.

The CCC recognizes and appreciates the contribution of the veterinarian to this project of national rehabilitation.

* * * *

Brucellosis in the Middle West[13]

This paper deals with the occurrence of brucellosis of human type (undulant fever) in Iowa as compared with other states. Consideration is given to the several means whereby brucella infection is conveyed to man from animals infected with Bang's disease. Particular emphasis is placed on the significance of various types of direct contact with infected hogs and cows. The rôle of ingestion of raw dairy products in causing human infection is likewise considered. Attention is given to age, sex, and seasonal occurrence of reported cases of undulant fever. Reference is made to the cooperative arrangement which exists between the Bureau of Animal Industry, State Department of Agriculture and the Iowa State Department of Health. Such cooperative effort leads to discovery of infected animals, aids greatly in revealing the probable source of infection in human illness, prevents additional cases from the original source and represents a means of controlling further spread of infection among animals. Information is presented pertaining to latent brucella infection in apparently healthy groups including veterinarians. Preventive aspects of undulant fever are considered. The paper was illustrated with the stereopticon and lantern slides.

[13] By Carl F. Jordan, Director, Division of Preventable Diseases, U. S. Public Health Service, Des Moines, Iowa.

The Public Health Program Under Title VI of the Social Security Act[14]

In 1890 and 1893 when the U. S. Public Health Service was put in charge of prevention of disease it was entirely limited to quarantine. Scientific knowledge has changed all this by eliminating local conditions from which diseases arise. From 1890 to the time the Social Security Act was passed, there had been inadequate recognition by the government.

For 20 years the Public Health Service has cooperated with the states through technical assistance, assignment of service officers and limited financial participation. Fortified by long experience in cooperative health work both the Public Health Service and the states were prepared to proceed with the administration of the public health provisions of the Act.

Title VI of the Social Security Act provides for an appropriation of $8,000,000 a year to assist the states in the establishment and maintenance of health service, and $2,000,000 a year to the Public Health Service for investigations of disease and sanitation.

Allotments of funds to the states are used for aiding and developing county health departments, public health education, communicable disease control, maternal welfare, sanitary engineering and industrial hygiene.

Neither medical care nor cash benefits to compensate individuals on account of illness is contemplated under the provisions of the Social Security Act.

All funds paid to the states become state funds just as if they had been appropriated by the state legislatures and the work done within the states is under the direction of state authorities.

The Surgeon General of the Public Health Service is responsible for the allotment of funds to the states and must take into account certain major factors, namely, population; special health problems and financial needs of the state.

[14] By C. E. Waller, Assistant Surgeon General, U. S. Public Health Service, Washington, D. C.

C. C. Hastings

C. E. Waller

Doctor Hastings was Secretary of the Section on General Practice.

It is within the discretion of the state health authority to select the activities considered best for his state, subject, of course, to the final approval of the Public Health Service.

Portions of the allotments to states are used for the training of personnel. Selection of trainees is made by the state health officers and is limited to persons already on health department staffs or picked especially to fill anticipated vacancies.

The training courses offered are calculated to qualify the trainees to meet the standards adopted by the 1935 Conference of State and Territorial Health Officers. The adoption of such standards has a twofold benefit; it discourages the appointment of individuals with little more to recommend them than political influence, and gives those who are appointed because of training and personal fitness a fair degree of protection against political pressure.

For the convenience of the state health departments the Public Health Service maintains five regional offices located in Washington, New York, New Orleans, Chicago and San Francisco. Special advisory service in particular fields is furnished to state health officers, upon request. Notable among these is the making of special surveys of state and local health organizations.

Occasionally it is found necessary to lend an officer to serve temporarily as state, county or city health officer when assist-

ing in the reorganization of state health services.

Through the annual conference of the state and territorial health officers with the Surgeon General of the Public Health Service in Washington, further contact is maintained with the state health authorities.

The aim of this service is not to establish federal jurisdiction over health work within the states but to aid them in strengthening their own health services.

E. A. Rodier

R. E. Rebrassier

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What Can We Expect From a General Campaign Against Tuberculosis[15]

The former idea that tuberculosis is hereditary has given way to the recognition of its infectious nature. Due to education, improved economic condition of the masses, and temporary isolation of the patients, the death rate from tuberculosis has declined by more than 50% in the last 20 years. The veterinary profession has played an important rôle in this achievement by attacking the problem at one of its principal sources, the contaminated food supply. The mortality seems to have reached a stabilized level. A revolutionary change in traditional medical practice is necessary to continue the decline. This will require the detection of tuberculosis in the individual prior to the onset of obvious clinical symptoms; a thing that can be done only by the use of the X-ray. Such a procedure is effective not only in uncovering the cases occurring in suspected individuals, but also in uncovering unsuspected cases in the household from which suspected cases come. A general campaign against tuberculosis will ultimately succeed in reducing the loss of life and financial burden which now result from that disease.

[15] By John F. Allen, Associate Professor of Medicine, University of Nebraska, College of Medicine, Lincoln, Nebr.

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Organizing a Bureau of Animal Welfare for Kwangsi Province, Southwest China[16]

China is essentially an agricultural country, the entire livelihood of more than 80% of its population being dependent upon agricultural products and domestic animals raised for profit. In Kwangsi Province, the water buffalo is an absolute necessity in tilling the soil, for the production of rice, its principal agricultural product.

The yardstick by which prosperity is gauged is the family yearly income which determines buying power. The answer to the problem of increasing the buying power of the masses of Chinese people, lies in the establishment of mass methods of animal disease control and animal improvement, for domestic animals are the one most important factor that determines family yearly income. In Kwangsi Province alone, before 1933, the loss from preventable communicable animal diseases exceeded $2,000,000.00 per year. Increased value of domestic animals resulting from a rational program of animal improvement was estimated to add another $2,000,000.00 to farmer revenue.

For the above reasons, a Bureau of Animal Welfare was organized in May, 1933, with an annual budget of $250,000.00. (Mex.) At the same time, a school for training livestock inspectors was established. Three years after its establishment, a modern laboratory and teaching plant, representing an investment of $350,000.00 for buildings and equipment was in full operation at Nanning, Kwangsi, six hundred miles west of Canton and one hundred

[16] By E. A. Rodier, B.S., M.S., D.V.M., Technical Adviser and Director, Bureau of Animal Welfare, Kwangsi Province, Government of Southwest China.

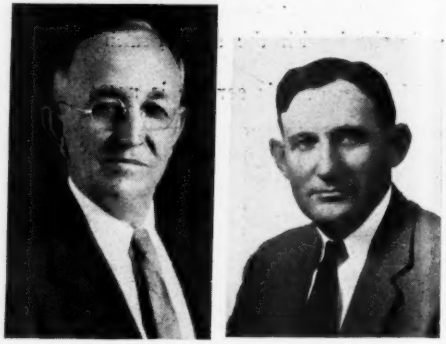
and eighty miles north of the French Indo-China frontier, producing enough vaccine to immunize 3,000 animals per week, vaccinating being done by seven specially trained native vaccinating crews, with 200 livestock inspectors permanently stationed in the field and a livestock improvement program under way to improve native cattle by selection, castration and the introduction of forage found to be successfully grown in Kwangsi, for in a demonstration county it was conclusively proved that modern methods produce effective results.

One Hundred Percent Meat Inspection[17]

According to a federal law, meat shipped in interstate commerce must be inspected under veterinary supervision. At present, this service covers 65% of the meat supply of the United States. The states, however, with the exception of California have grossly neglected to follow the leadership of the federal government, and allow 35% of the meat supply of the nation to be prepared and processed under good, bad, indifferent, city, county, or state inspection, or none at all. Thus in one state 95% of the meat prepared for home consumption has no inspection at all. An alarming feature of our present meat packing situation is that animals that the owners suspect may not qualify for slaughter in plants having proper inspection, gravitate to houses in which inspection is lax or lacking.

It is only logic that meat sold locally should have as adequate inspection as that sold interstate. The average housewife is little aware that under the patriotic sounding name "home dressed meats" she may be buying meat or meat products from diseased animals, slaughtered under deplorable and unsanitary conditions, prepared with prohibited and dangerous preservatives, dyes, or coloring matter. It is only too apparent that the consuming public is unaware that daily there is sold through markets meat from animals affected with a long list of diseases transmissible to man.

The veterinarian should be the guardian of public health from the hazards of diseases of animal origin. Meat inspection is a function of the veterinarian. It is, therefore, the duty of the veterinary profession to advise the consuming public with reference to the danger encountered when buying meat under the present system, and to educate it to demand meat which has been properly inspected and prepared under sanitary conditions. Not until such a demand has been created for proper inspection of food, will the filthy, contaminated local slaughter houses be abolished.



Walter Hyde Martin C. C. Hisel

Doctor Hisel was chairman of the Section on Sanitary Science and Food Hygiene.

To remedy the present situation Lawrence proposes that federal funds be tendered to the states through the Social Security Act, to be used in full and complete cooperation with the states, seeking adequate state and federal meat inspection control which would forever outlaw the slimy slaughter houses found in every state in the nation; or that two million dollars be added to the annual federal meat inspection appropriation to be used in cooperation with the forty-eight states in bringing about a safe and sane meat inspection which will eliminate unhealthful, unwholesome, and disease-producing meat products in the 35% now inadequately inspected. A uniform law, patterned as closely as practical, to the federal law, should be prepared and presented to all state legislatures; making it clear what the intent of such a law is, and asking that it be passed without modification.

Lawrence urges the A.V.M.A. to organ-

[17] By W. A. Lawrence, San Antonio, Texas.

ize a movement for 100% meat inspection by employing motion pictures of "horrible examples" in the way of local slaughter houses and the contrast with federally inspected packing plants, also by lectures, magazine articles and otherwise.

The Veterinarian's Duty in Standardizing Dairy Inspection[18]

The veterinary profession of the United States supplies a well organized and efficient veterinary service. Veterinarians have demonstrated the value of veterinary medicine to society as a whole in protecting man from transmissible animal diseases. Every state board of health should have a veterinary member for counsel, if for no other reason. Martin urges that it is the duty of the veterinarian to challenge the manner in which present dairy inspection is carried on throughout the country, and to demand the standardization of dairy inspection which, at the present time, is largely in the hands of an untrained personnel and is conducted in a haphazard and for the most part inefficient manner. Food and milk inspection is one of the undeveloped fields of veterinary science in the United States. The veterinarian alone is capable of safeguarding the nation's milk supply. However, he questions that all veterinarians are as well qualified for milk inspection as they should be, or that our veterinary colleges offer a broad enough course of training in this subject.

Participation in Preventable Live Stock Loss Program[19]

The veterinarian is the first line of defense as well as the point of attack and the rear guard in problems of livestock diseases, parasites, and the spread of infections or contagion.

The field of handling and preventing livestock losses from the farm to the market is still wide open and largely uncharted, offering real opportunity for veterinary initiative and practical application of scientific knowledge.

Efficiency in livestock production and marketing through reduction and elimination of preventable losses can be greatly increased. The value in dollars of the annual unnecessary loss reaches a staggering sum.

Live stock loss problems begin on the farm where the livestock begins. Feeding, care, handling, shelter and sanitation are principal questions bearing on later possible losses. The able veterinarian must become a public—even a livestock-relations man in order to get closer to the producers' problems and serve the industry in a broader way.

Corrective practices, educational propaganda and diplomacy are just as necessary to the veterinarian as good veterinary practices and technique.

New methods of marketing have opened new avenues and ways of serving the producer and the industry. Barriers of suspicion and antagonism must be removed.

Cooperation and assistance of the profession in the campaign of The National Live Stock Loss Prevention Board has been most effective and beneficial.

Urinary Calculi with Special Reference to Cattle and Sheep[20]

The author has had wide experience in handling outbreaks of calculi in both cattle and sheep. He directed attention to various explanations that have been given for the development of the disease and the work that has been done by the various experiment stations throughout the country. Those who have worked with rats believe that vitamin A deficiency is of great importance in precipitating calculi. Some regard a mineral imbalance as being the chief factor. Calculi have been caused by feeding high phosphorus and low calcium diets as well as by a high calcium and low phosphorus diet. Field experience indicates that sheep and cattle not infrequently show urinary calculi when all feeds are high in

[18] By W. H. Martin, El Reno, Okla.

[19] By Earl G. Reed, Supervisor Agricultural Development, Union Pacific Railroad, Chairman, The National Live Stock Loss Prevention Board, Omaha, Nebr.

[20] By I. E. Newsom, Colorado State College, Fort Collins, Colo.

phosphorus, such as, wheat bran, cottonseed and linseed meal.

I. E. Newsom

Apparently the disease is more common in the winter than in the summer, which may be due either to a lack of vitamin A or a lack of water consumption. Most people feel that hard water produces urinary calculi, but the experience of workers in this field does not bear out this contention. Probably the amount of water consumed has much more to do with the case than the quality of it. Suspicion has been thrown on beet by-products, such as, beet pulp and tops, but work done at Purdue University indicates that these increase the flow of urine, and consequently would be less likely to produce trouble. Cereal grains high in mineral content, particularly phosphorus, and lack of vitamin A seem to be the chief factors producing urinary calculi in cattle and sheep.

An Investigation of Severe Losses from Abortion in Ewes[21]

Severe losses from abortion in ewes were encountered in Big Horn County, Wyoming in the early spring of 1937. This abortion was of a very infectious nature. Approximately 500 ewes aborted out of a total of 1050 which were with lamb and which had been exposed. About 50 of the aborting ewes died. The bucks had been turned in with the ewes November 19 and had been taken out January 3. Losses from abortion started February 20, averaging from one to fifteen abortions per day. Detailed laboratory work was done on the aborted lambs, placenta, vaginal discharges of the ewes, and blood of the ewes. In none could any evidence be found which would incriminate the Vibrio, or the Brucella which is the cause of abortion in cattle.

A small gram negative, non-motile, non-spore forming, rod-shaped organism was consistently isolated from the aborted lambs and the vaginal discharges from the ewes. The various physiological activities of this organism were worked out. No organism which checks with it is listed in the Manual of Determinative Bacteriology. The organism when injected in pure culture intravenously into healthy pregnant ewes caused abortion. The vaginal discharges of aborting ewes when fed caused abortion. The pure cultures when fed and placed in the vagina did not cause abortion in pregnant experimental ewes.

[21] By A. M. Lee and L. H. Scrivner, University of Wyoming, Laramie, Wyo.

Bacterial Interference with Serum and Virus Immunization[22]

Since the beginning of the serum and virus method of immunization against hog

A. M. Lee

Henry Hell

cholera there have been breakdowns that defied explanation.

Sometimes of say 10 herds of shotes vaccinated in about the same general condition, with the same serials of serum and virus, nine herds would do well and one would break with a condition that closely resembled hog cholera. We have attributed this condition to secondary invaders without trying to find out just what these invaders are.

It was found that when animals having suipestifer infection were injected with serum and virus, reaction would sometimes appear as early as the third day. Murray and associates found Suipestifer as a primary local intestinal infection. McBryde found it in pure culture in the messenteric lymph nodes and lung tissue. He found it

[22] By Henry Hell, Wilton Junction, Iowa.

also in the spleen, heart blood and the kidneys.

Clinical interpretation indicates that the organisms are taken up from the intestinal walls by the lympatics functioning in fat assimilation, carried to the messenteric lymph nodes, thence on to the thoracic duct and the anterior vena cava into the pulmonary circulation and so on into the general circulation.

Limited clinical experience indicates that suipestifer infection in the septicemic form yields to a bacterin consisting of the entire, chemically devitalized broth culture of *Salmonella suipestifer*.

It seems that we must turn back to the work of Salmon and Smith and again take up the bacterial study of these organisms that they believed to be the specific cause of hog cholera and swine plague, and study them as accessories to virus infection.

Studies of Erysipelothrix Rhusiopathiae with Special Reference to Rough and Smooth Colony Types of Cultures[23]

The authors report that colony types of the *Erysipelothrix rhusiopathiae*, the causative organism of swine erysipelas, can be classified into three groups, viz., smooth, rough, and intermediate, and give a description of each.

Primary isolation from animal tissues were found to be, as a rule, of the smooth type regardless of whether obtained from acute swine erysipelas or the chronic infection of the tonsils or joints. In an exceptional case, however, smooth cultures were obtained from two joints of an adult boar affected with the chronic arthritic type of erysipelas and at the same time a rough culture was obtained from a third joint of the same animal. Cultivation of the organism over a period of time in the laboratory caused smooth cultures to become rough. One instance is cited where a rough culture on primary isolation changed to smooth by cultivation over a period of time. The factors responsible for these changes in colony formations have not been definitely determined. Factors found to influence the type of colony formations were the type of culture medium on which the organism was grown, the pH value of the medium, and the time interval between subculturing.

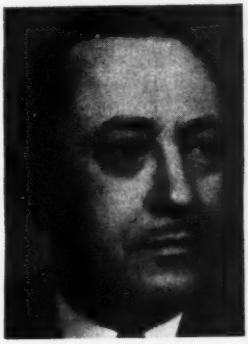
The smooth cultures have been found, as a rule, most suitable for production of antigens for the agglutination test for swine erysipelas. A description is given of the method of preparation of swine erysipelas antigens, including a method of maintaining the seed cultures that has been found satisfactory for retaining their smooth characteristics.

Smooth cultures of *Erysipelothrix rhusiopathiae* have been found to be virulent for mice and pigeons without exception and rough cultures proved with equal regularity to be non virulent. Mice injected with the avirulent rough cultures proved to be immune to subsequent injections of virulent smooth organisms.

[23] By H. W. Schoening, W. S. Gochenour, and C. G. Grey, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C.

Pullorum Disease of Turkeys Studies on Incidence and Carriers[24]

Pullorum disease of turkeys was first reported in United States by Hewitt in 1928. This outbreak occurred in Minnesota, and since then published reports have come from Michigan, New York, Maryland, Pennsylvania, California and Virginia, as well as from England and Holland.



H. W. Schoening

In California, at least, the disease is not yet a serious one to the turkey industry but the number of outbreaks has increased during the past few years. Chickens appear to be a greater danger than turkeys from

[24] By W. R. Hinshaw, University of California, Davis, Calif.

the standpoint of transmission. The commercial hatching of turkey eggs by concerns that also hatch chicken eggs is probably the principal means of transmitting the infection from chickens to turkeys.

W. R. Hinshaw

In young turkeys the disease manifests itself in much the same way as in young chicks. Information on the age incidence obtained in 42 outbreaks shows that the majority of cases start by the end of the first week after hatching. Two acute outbreaks in poults from seven to nine weeks of age and one outbreak in three month old turkeys have been encountered. The course of the disease varies from a few days to as long as three weeks. The average mortality in 32 outbreaks involving 19,647 poults was 34.5%.

The carrier problem in turkeys that recover from acute outbreaks does not appear to be as great as in the case of chickens. Four flocks that suffered acute losses as youngsters, have been under observation and from one to three agglutination tests have been made on the survivors. The average number of reactors on the original test in these flocks was 10.2% based on a 1:20 dilution of the blood serum and antigen. Approximately one-third of the reactors had titres of only 1:20. From these reactors a group of 129, showing titres from 1:20 to 1:320 have been autopsied. *Salmonella pullorum* has been isolated from 14 or 10.85% of these reactors, which is considerably lower than the expected infection incidence in chicken reactors.

Likewise, the incidence of egg infection in carriers has been found in these studies to be lower than the expected incidence in eggs from infected chickens. A total of 945 eggs from 21 reactor turkey hens from four different flocks have been examined bacteriologically and five (0.53%) eggs were found to be infected with *S. pullorum*. These five eggs were laid by three hens originating from two of the four flocks. In no case has *S. pullorum* been isolated from a live embryo, or from a poult hatched from an egg laid by an infected turkey hen.

Fowl Leukosis[25]

Studies were reported on Strain I, a form of transmissible leukosis that has remained constant over a period of eight years. It is transmitted most successfully by intravenous injection into young chickens. It has a variable period of inoculation from one week to four months. Affected birds usually remain in good condition, develop an anemia, the skin bleeds easily and bleeding occurs when the feathers are rubbed or pulled. Death often occurs before the disease is found clinically. Rigor mortis sets in early, hemorrhages are found in the muscles; the liver, spleen and bone marrow are swollen. Microscopically immature blood cells are found in the bone marrow, liver and spleen, and, in the later stages, flooding the circulation.

Eight experiments are described in which whole blood and liver suspensions from chickens with leukosis were injected intramuscularly and subcutaneously to try out its ability to produce tumors. Whole blood was collected from seven different donors suffering from leukosis and injected into the muscles of the breast of 59 chickens. Thirty-five cases of leukosis developed but there was no evidence of tumor formation at the site of the injection. Livers were obtained from four different chickens suffering from leukosis. Suspensions of such liver tissue were made by finely mincing in Ringer's solution and injected into the breast muscles of 52 chickens. Twenty-six cases of leukosis developed but there was no evidence of tumor formation at the site of injection.

Strain I, in these experiments, gave no evidence to indicate any relationship to tumor production. No cases of paralysis were found in this series of experiments and no evidence was found to indicate that Strain I has any relationship to pa-

[25] By E. L. Stubbs, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, Pa.

ralysis. Injections of whole blood and liver suspensions intramuscularly resulted only in the production of leukosis. These experiments indicate that Strain I is a pure strain and stimulates only abnormal hemapoiesis.

The Viability and Immunizing Value of Egg-Propagated Laryngotracheitis Virus[26]

Thus far two investigators have propagated laryngotracheitis virus on the chorioallantoic membrane of the developing hen's egg, and have vaccinated birds with rather fresh material but no one has determined the keeping qualities of such virus. In our experiments seven lots of vaccines were prepared from tenth generation virus. The lots differed only in respect to the age of the embryonated egg at the time of inoculation. The virus was dried *in vacuo*, stored under refrigeration and tested periodically. Two lots of vaccine were prepared from 25th generation virus.

F. R. Beaudette

E. L. Stubbs

For testing, suspensions were made containing 20, 10, 5 and 1 mg. of dried virus per cc of diluent and readings were made on the fifth day. Out of 252 birds vaccinated in laboratory tests, 250 were alive for a fifth day reading and of these one was questionable and three were negative. Of these four birds only one was significantly negative. These results are a compilation of nine titrations on tenth generation virus over a period of 421 days after the virus was prepared, irrespective of dose of virus.

The results show that continued propagation in eggs does not change the immunizing power of the virus.

In field trials on over 5,000 birds and with virus up to 460 days old the results were entirely satisfactory with suspensions containing 20 mgs. of virus per cc.

In conclusion, it is evident that egg-propagated virus maintains its potency and immunizing power and is superior to naturally produced virus in that contamination by pathogenic bacteria or other viruses is impossible.

[26] By F. R. Beaudette and C. B. Hudson, New Jersey Agricultural Experiment Station, New Brunswick, N. J.

Inspection of Poultry and Poultry Products[27]

The veterinary profession should be particularly interested in the inspection of dressed poultry carried on under the supervision of the Bureau of Agricultural Economics, United States Department of Agriculture. This work began in 1928. It is a voluntary service as far as the government is concerned but several cities have ordinances requiring inspection of drawn poultry and canned poultry products.

In the inspection of poultry, the examination of each poultry carcass and the eviscera is required. The equipment used is similar to that used in inspecting hogs in a large packing house. In 1936 over 33,000,000 pounds of poultry was inspected and about 700,000 pounds condemned.

The services of graduate veterinarians are required in the inspection of poultry. The inspection work service bids fair to expand considerably because of the recently awakened interest in the merchandising of full drawn quick frozen poultry. This type of poultry offers certain advantages in the way of decreased cost of handling, an inspected product and a more attractive product from the standpoint of retail sale and should, therefore, be prepared in constantly increasing amounts. Much of this poultry will be government inspected and this should, therefore, increase the amount of poultry inspection work considerably.

[27] By R. B. Mericle, Poultry Inspector, Bureau of Agricultural Economics, U. S. Department of Agriculture, Omaha, Nebr.

Coli-Bacillosis in Young Chicks[28]

Organisms of the *B. coli* group occasionally become pathogenic in calves, pigs, foals, lambs and other young animals. Poultry may also become infected with pathogenic *B. coli* organisms and as in larger animals the young are most frequently affected.

During the early Spring, chicks were received at the Maryland Live Stock Sanitary Service Laboratory from four different flocks at various times, all originating at the same hatchery. The history of mortality and the lesions found strongly indicated pullorum disease. The cultures were negative for this infection, but pure cultures of *B. coli communis* were obtained from the liver and heart blood of all the 19 chicks examined.

Inspection of the hatchery indicated that improper incubation and lack of ventilation had caused poor hatches of small, weak chicks. The owner reported numerous complaints of heavy mortality.

It was quite evident that a pathogenic strain of *B. coli communis* had become established in the hatchery, infected the weakened chicks and through them was spread to several flocks. With the installation of new incubators, thorough cleaning and disinfection of the premises and improvement in ventilation, losses from *B. coli* infection ceased.

Several of these weakened chicks and some vigorous ones from another hatchery were exposd to *B. coli communis* through various methods in the laboratory. There was a 45.4% mortality in the weakened chicks while the only deaths in the vigorous chicks were those injected subcutaneously. *B. coli communis* organisms were isolated from the liver and heart blood of virtually all chicks that died.

This infection may be confused easily with pullorum disease, since the history and lesions are very similar. Bacteriological cultures clearly differentiate them.

[28] By Charles R. Davis, Assistant Poultry Pathologist, Maryland State Board of Agriculture, College Park, Md.

Controlling Poultry Diseases[29]

When principles of poultry sanitation are neglected, many disease problems will be encountered. A thorough knowledge of poultry diseases and poultry husbandry enables the veterinarian, who plays an important rôle in the production of viable chicks, to render service that will highly be appreciated.

Pullorum disease is the most fatal poultry disease. Short-interval retesting until the percentage of reactors is reduced to at most 5% will assure viability of baby chicks. In the efforts to control pullorum disease, one should not lose sight of the fact that not all of the chicks die with the disease in chickhood. As many as 25% to 50% of the infected chicks may survive the attack and become carriers.

If the future crop of baby chicks is to be considered, the carrier hen must receive increased attention. The pullorum organism which originally lives in the blood stream of baby chicks, localizes most commonly in the reproductive organs, remaining there as a focal infection. Preventing the eggs of carrier birds from getting into the incubators is the only means of successfully controlling this disease. The tube agglutination method is a very reliable and dependable diagnostic method. It is only with the "disease eradication minded" hatcherymen that veterinarians can make rapid progress in the control of pullorum disease; as one of them phrased it: "blood testing is to the poultry industry what spraying is to the fruit grower."

There is considerable work attached to this method of testing, and it involves considerable outlay for laboratory equipment. In addition to tube testing the flock owner should be advised to improve, where possible, the sanitary and hygienic conditions, to provide plenty of fresh air and fresh, clean drinking water.

Coccidiosis in young chicks is next in importance to pullorum disease. It is a filth-borne disease. The "6 C" program, clean chicks, clean ground, clean brooder

[29] By F. C. Tucker, Claypool, Ind.

F. C. Tucker

F. F. Parker

houses, clean litter, clean feed, and clean management, if followed to the letter, will contribute a very important part in the general health condition when the pullets are ready to house. It is not difficult to make a diagnosis of coccidiosis in chickens. Formerly one depended on the evidence of bloody droppings; such is not the case today. There are many types of the disease recognized, but bloody droppings are found only in the cecal type. There is no drug or combination of drugs which will cure coccidiosis in chickens.

The symptoms of coccidiosis are: attack of a large number at a time, ruffled feathers, great depression. At autopsy extensive tissue destruction is found in the intestinal tract. Feeding buttermilk is still the best palliative. Explaining the life cycle of the coccidium to the poultry farmer aids in inducing him to provide sanitary measures.

Chicken pox is a disease that can well be prevented by vaccination of the young birds between the ages of one and three months, while they are still on the range, or at least one month before they are put in the laying house. If there has been no pox on the farm, and none in the community, vaccination is not recommended. It is advisable only if there is probability of an outbreak. Pox is a skin disease, spread by contact or carriers. Pullets that are in the laying house should not be vaccinated, unless there is grave danger of their infection.

Diagnosis of Poultry Diseases[30]

Some of the factors or conditions that influence poultry diseases are the weather, feeding, breed susceptibility, age resistance. Certain diseases occur at certain times of the year, and in this case the character of the weather is the determining factor, not the time of the year. Cholera occurs in wet and cold weather. Fowl typhoid is seen in the hot and dry seasons. Generally the respiratory diseases of mature birds are those of housing, dampness and cool weather. Chickens and other poultry are not only liable to gross errors of feeding and management, but are subject to a series of infections that are ever ready to infect and kill at any or all seasons of the year. The feeding of high levels of protein will of itself produce a disorder and loss. Breed resistance or susceptibility to disease is a phenomenon of many flocks. Age resistance is of less importance. New Hampshire Red chickens are very susceptible to pullorum disease while the Mediterranean breeds seem to be generally resistant. Poultry that live in close association with a disease often produce young that are resistant. This observation applies to fowl typhoid and fowl leucosis. Not all the causes for resistance are known. No resistance has been developed toward tuberculosis and cholera.

In coccidiosis the clinical symptoms and the post-mortem lesions depend on the particular species of coccidia involved. Coccidiosis is often complicated with other parasitoses and with fowl leucosis. Renal coccidiosis of geese is rare.

Pullorum disease affects chickens and to a less extent turkeys. The disease is closely related to fowl typhoid. The organs affected are the same; the lesions are almost identical. Pullorum disease is an infection of all ages of chickens but usually kills only young. Fowl typhoid is a disease that kills all ages but usually does not affect baby chicks. Pullorum infection in baby chicks is, as a rule, a dormant or semi-dormant infection which requires some-

[30] By S. H. McNutt, Iowa State College, Ames, Iowa.

J. S. Koen
Doctor Koen discussed "General Veterinary Service" over radio station KFAB.

thing to give it a start. The diagnosis of pullorum disease is not difficult, but one should use care to eliminate other causes for death losses. Fowl typhoid is often slow in getting a start. It gradually gains in severity until losses are extensive.

Fowl cholera, a wet and cold weather disease, occurs in a septicemic form and a localized form, or in a combination of the two. Edema of the wattles is often an aid to diagnosis. The spread of the disease is rather slow, except when a large number of susceptible chickens have access to the flesh of one that had died of cholera.

In the middlewest goose septicemia is the most important infectious disease of geese. It is common in turkeys, but rare in ducks.

Tuberculosis is one of the major diseases of poultry. Any disease that produces spherical lesions of the internal organs might be mistaken for tuberculosis, for instance fowl leucosis and enterohepatitis.

Paratyphoid of turkeys is one of the important infectious diseases of young poults that are being forced for rapid gains. Absence of necrotic areas in the liver differentiates paratyphoid from blackhead. It occurs as a rather benign disease in chickens. In ducks it is known as keel disease.

A Survey of Some Common Conditions Encountered in Cat Practice[31]

Cats are inexpensive pets and form a lucrative source of veterinary practice. To overcome the timidity and suspicion of a cat in the examining room, and to guard against scratches and bites, the veterinarian must use tact and patience in handling this animal.

Cats that shake their heads and scratch themselves, most likely suffer from ear mites. Cleansing the ear and filling the duct with derris root powder effects a cure. A thick skin with characteristic scabby incrustations on the head and neck are indicative of sarcoptic mange. Three applications of a mixture of potassium carbonate (5½ oz.), oil of tar (5½ oz.), flowers of sulphur (1 lb.), and oil of rape seeds (7 pints), usually clear up the condition. Ringworm readily yields to a 0.2% alcoholic solution of mercury bichloride, or to iodine one part in two parts of glycerine.

Cuterebra larvae which have their seat under the skin in the region of the neck and shoulders are removed mechanically. In hookworm infestation tetrachlorethylene should be given, followed by epsom salt to insure elimination and to prevent toxic absorption. Whipworms are difficult to eliminate, although sanotonin is of some benefit. Tapeworms respond to arecoline treatment. Methenamine tetraiodide is effective against coccidia.

In bacillary necrosis it is very important to cut and curette away every particle of diseased tissue. If the tail is badly infected, amputation becomes necessary.

Accumulation of tartar is one of the predisposing causes of Vincent's disease. Painting the gums with 2% chromic acid solution after removing the deposits is indicated.

Infectious feline gastro-enteritis is ushered in by high fever, great prostration, vomiting, and dysentery. Anti-feline enteritis serum is a very good preventive, and may have some curative value.

[31] By F. F. Parker, Des Moines, Iowa.

C. W. Bower

S. W. Haigler

Common disorders are hair balls, conchal hematoma and epilepsy. For the latter condition no effective treatment exists, other than good care and nourishing food.

Before attempting abdominal surgery, a careful fecal examination should be made. The elimination of parasites prior to operations avoids complications in the after treatment. A suitable time for castration is at the age of six months. For spaying the incision is made one inch posterior to the navel. After the incision is made the rear of the patient is elevated to facilitate the hooking of each tube. The hysterectomy should be complete. Cats should be hospitalized for one week after spaying.

In dystocia cases, where the presentation is normal, the uterus should be filled with sterile mineral oil. If at the end of one hour there is no progress, forceps must be employed. For valuable queens, cesarean section is recommended.

Other common troubles are the swallowing of needles and fish bones. Calculi are usually found lodged within an inch of the tip of the penis in the male cat. They may be removed with a small, hard rubber bougie, or snared with a loop of silkworm gut. If these methods fail, the cat may be relieved by splitting the ventral surface of the penis. Clipping matted hair should be done over a comb, else one is liable to snip off the skin.

Cats rarely have rickets, rheumatism, chorea, tetanus, or become poisoned by snake bites. Cats may have from three to four litters of kittens per year. The heat period may last from three to fifteen days.

Coal-tar products should be avoided in the internal and external treatment of cats. Strychnine is dangerous in doses even as low as 1/200 grain. Morphine crazes cats.

Blood Transfusion in Dogs[32]

Blood transfusion is a modern method of therapy in dogs. It is particularly indicated in shock and internal hemorrhage, frequently the two together. It also is indicated in various types of anemias, infectious enteritis in cats, distemper in dogs, slow convalescent patients from any infectious disease, and also in certain types of toxemias.

There are two main types of blood transfusion. First, the direct method and second, the indirect method. Of the direct method the most popular method is the vein to vein and heart to vein. The latter is preferable in the majority of cases. The vein to vein method is very slow. There is greater danger of blood clotting. Heart to vein is a little faster and the danger from blood clotting is lessened.

The writer recommends the heart to peritoneal cavity as the most practical, besides getting the value from the blood, the patient gets a leukocytosis from the breaking down of the blood platelets. This is very advantageous.

Direct transfusion of blood into the right heart is indicated in cases of severe shock, and particularly in those cases where the blood pressure is so low that the vein cannot be raised. When blood is injected directly into the right heart of the recipient the arterial pressure is restored and the venous volume is reestablished. Blood pressure is maintained for a much longer time when a transfusion of blood is used than when physiological saline solution is used. The explanation as to why saline injections do not cause sustained rises of blood pressure must be thought of in terms of osmotic pressure of the blood colloid.

Some care must be given to selecting the

[32] By Chas. W. Bower, Topeka, Kans.

E. C. Jones

Doctor Jones discussed anthrax over radio station KMA.

donor. An animal which is to be used as a donor should be free from any infectious diseases and particularly free from *Dirofilaria immitis* and *Demodex folliculorum.*

Typing the blood for incompatibility is not necessary when the heart to peritoneal cavity method of transfusion is used. Prominent among the indirect methods of blood transfusion is the sodium citrate method. This consists in adding a given quantity of a 2½% solution of sodium citrate to the blood which is draw from the donor. When this is thoroughly mixed it is injected into the vein ofthe recipient.

Sodium citrate transfusion is, of course, subject to all the accidents and drawbacks incident to transfusion by any other method, and in addition there is the possibility that the blood may clot in spite of all precautions. This may be due to the fact that the blood and sodium citrate were not mixed with sufficient thoroughness or because there is not a high enough percentage of sodium citrate to mix with the blood. Then again there is a slight danger of getting a sodium citrate reaction on the patient. This may vary from symptoms of chilling to tetany. This probably is a result of fixing the blood calcium by the sodium citrate.

Autohemotherapy is not a transfusion. It consists merely in withdrawing from 1cc to 10cc of the patients blood and injecting it deep into the muscles. As to its manner of action there is little agreement. The idea first advanced was that it was a form of protein shock therapy. It has been shown that the blood is absorbed with greater rapidity than foreign proteins. The writer has used this therapy on a number of cases particularly, dermatitis and also in certain types of infection. Very encouraging results have been obtained from dermatoses that have been treated by this method.

Non-Parasitic Skin Diseases of Dogs[33]

The classification of non-parasitic skin diseases is still an unsolved problem in veterinary medicine. There is, however, a growing demand and a long-felt need for a better definition of these ailments. The terms "eczema" and "dermatitis" are confusing and fail to designate with any degree of definiteness the pathology of the process.

Unfortunately veterinary training in skin diseases has been neglected. The practitioner should be educated to make a descriptive diagnosis rather than a symptomatic diagnosis. Such a habit would not only prove helpful in this crusade against the use of harmful eczema nostrums, but will also tend to raise his professional esteem to a higher level in the eyes of the public which is already beginning to be more exacting when asking for an explanation of disease conditions.

So far, little has been accomplished in classifying eczemas from an etiological point of view. Some trace eczemas to allergy or hypersensitivity, to metabolic disturbances, to nutritional and vitamin deficiencies, or to external causes. The following factors have from time to time been accused of being the underlying of eczema: Heredity, dry skin, oily skin, pus-infection, fungus infection, focal intoxication, disturbance of metabolism, the asthma complex, nervous disorders, allergy.

There is no doubt that breeding and feeding exert an influence on the incidence of eczema. Dogs possess idiosyncrasies to certain foods. When a dog vomits persistently, that particular food should be eliminated from the diet. Too frequent feeding and overfeeding should be avoided. The environmental factor must also be considered. Dogs, large or small, confined in efficiency apartments, do not get enough exercise. Other contributing factors are: irritating antiseptics, soaps, oils, fleas, lice, ticks, fungus infection, intestinal parasites, constipation, intestinal infection, nephritis,

[33] By S. W. Haigler, St. Louis, Mo.

Maurice C. Hall

Doctor Hall, a former president of the A.V.M.A., addressed the meeting on the subject of trichinosis.

G. S. Elwood

D. H. Udall

Winner of the International Veterinary Congress award.

infectious diseases, nervous temperament, vitamin deficiencies.

Before arriving at a diagnosis, the anatomical and physiological functions of the skin should be considered; this, together with a complete history of the case and the evaluation of laboratory findings often offers a helpful solution in the choice of treatment.

S. E. Hershey
Chairman, Section on General Practice.

In treatment the methods employed are more important than the medicine selected. In cases of moist eczema the hair should be clipped closely around the affected area. In cases of diffuse dermatitis the entire dog should be clipped. The skin should be cleaned before the application of any drug. For local application mild and soothing lotions, oils, ointments, or powders are indicated. Water is usually contra-indicated. Animals that are inclined to lick or scratch must be restrained, or the area must be covered with a bandage. A hypnotic dose of nembutal or similar agent, arsenical preparations and fetal extract, are some of the medications which have proved to be valuable adjuncts in some cases.

Careful observation and study, together with complete records of every case encountered will eventually help to solve puzzling cases.

The X-Ray in Small Animal Practice[34]

It is advised that the veterinarian own and operate his own machine rather than depend on someone else for this service, first becoming familiar with the types and sizes of machines and then purchasing the one most suitable to his purposes.

The x-ray may be used to find a foreign body, or to eliminate the possibility of one being present. It is sometimes an aid in the operation itself when removing foreign bodies, saving time and extended exploratory surgery.

Its most frequent use is in fracture work, both for diagnosis and for setting and checking after the cast is on. There is hardly a part of the bony structure that is not x-rayed sooner or later.

Early pregnancy is not usually recognized with the x-ray due to lack of bone formation, but during the last two or three weeks of gestation is indicated showing the number of fetuses present and their presentation.

Hydrothorax and ascites are x-rayed, foreign bodies or tumors sometimes being found as the causative agent.

The fluoroscope will be found indispensable, but with increased experience with the x-ray we use the fluoroscope less, taking more radiographs. The fluoroscope is used in alimentary work and in general examinations for foreign bodies and in fracture reductions.

[34] By G. S. Elwood, Christenson Animal Hospitals, Chicago, Ill.

The x-ray has an important place in small animal practice, and while it does not replace clinical observations it is an aid in the routine work of the hospital as well as in cases difficult to diagnose.

Meningitis, Encephalitis and Myelitis in Dogs[35]

Meningitis, encephalitis and myelitis occur rather frequently in dogs. Unfortunately, too often these diseases are not recognized as such and are incorrectly named. Cases of meningitis, encephalitis and myelitis are frequently named according to the symptoms manifested, such as various fits, spasms and paralysis.

The etiology of diseases of the central nervous system is varied. Frequently the differential diagnosis of the various diseases of the central nervous system is difficult. One must depend entirely upon the clinical history of the case, symptoms manifested and lesions noted. Certain tests of sensory activity that are of value in localizing lesions in the brain and spinal cord of man are of little if any value in dogs.

Meningitis commonly causes hyperesthesia of the skin, muscular rigidity of the head and neck, epileptiform convulsions and vomiting. The latter two symptoms are more frequent in young than in mature dogs.

Encephalitis may be disseminate or focal and accordingly may cause symptoms of a general nature or localized disturbances. Disseminate encephalitis usually causes marked disturbances of consciousness, incoördination of thought and activity, ataxia, uncontrolled movements and spasms. Impairment of sight and hearing, epileptiform convulsions, vomiting, spastic paralysis and increased action of the tendon reflexes are frequently observed. All of these symptoms may or may not be present.

The symptoms of focal encephalitis may simulate those of an intracranial tumor. One or more individual functions may be affected. The symptom referred to as chorea or tic in dogs is a frequent manifestation of focal encephalitis.

Myelitis commonly causes paralysis of one or more limbs. If the lumbar portion of the spinal cord is affected urinary and focal incontinence may be noted. Myelitis usually causes flaccid paralysis. The tendon and skin reflexes com-monly are diminished or absent below the affected portion of the spinal cord but they may be increased in the affected region. Peripheral anesthesia and trophic disturbances are frequently observed in this disease. Disturbances of consciousness, epileptiform convulsions and vomiting are absent.

C. F. Schlotthauer

A Study of the Effects of Different Methods of Breeding Upon Fertility in the Bull[36]

The methods compared were: pasture breeding, hand breeding and artificial insemination.

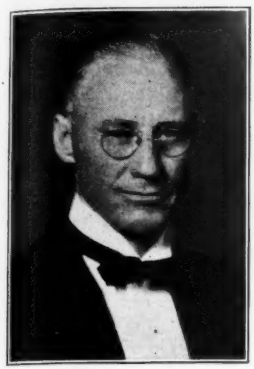
In pasture breeding the individuals are allowed to conduct their affairs according to their instincts. The endocrine and nervous systems are given full time to exert their influence upon the secretions that prepare the genital tracts for service, including the erection of genital organs and very likely, ovulation itself.

Pasture breeding is carried out during the summer months. The effect of green grass with its abundance of vitamins E and A, may be as important as any other factor in the breeding program. Normal exercise favorably influences the health of both male and female.

Hand breeding is conducted by placing the cow and bull in a corral by themselves. Both male and female are more or less influenced by surroundings and also by the interference (or aid) of attendants. They are frequently forced to mate at a time in

[35] By Carl F. Schlotthauer, Mayo Foundation, Rochester, Minn.

[36] By H. E. Kingman, Wyoming Hereford Ranch, Cheyenne, Wyo.



H. E. Kingman

the estral period and under conditions that would not take place normally. That such a service frequently results in failure is supported by clinical evidence. The causes of failure are obscure. It is the opinion of some of us that the relation of service to the duration of estrum may be an important factor in fertilization. At least the speculation that copulation affects ovarian function is not unwarranted. Preparation for the sexual act is probably less important in the case of the bull than in the case of the cow.

Many other factors may affect the success or failure of hand breeding; some of the advantages are, that more accurate account can be made of the time of service. It gives opportunity to determine the condition of the individuals participating; the number of services can be limited; and a semen specimen can be obtained.

Artificial insemination offers a better opportunity for an intimate study of breeding problems than any other plan. During the collection of semen, followed by its introduction into the female, opportunity is presented for the observation and examination of the genital tracts of both sexes. This includes the macro and microscopic examination of the secretions of the male and female. When artificial insemination is contemplated the service is completed under observation. This in itself is an important part of the study of the reproductive problem. The keeping of records is difficult and requires patience and perseverence, but records are absolutely essential to a successful breeding program.

In a large number of cows bred by each method, the results on regular breeders were: Pasture breeding, 95%; hand breeding, 82%, and artificial insemination, 55%.

Some Nutritional Studies in Swine[37]

The interpretation or significance of demyelination of the myelinated fibers of the spinal cord is an extremely important point in the pathology of nutritional and infectious diseases. Some workers have attributed the change to a deficiency of vitamin A, while others have associated it with a vitamin B_1 deficiency. It has also been described as a part of the pathology of hog cholera. This degenerative change has also been associated with one form of so-called posterior paralysis of swine. During the course of investigations in this field we have observed severe degenerations of the myelin sheaths in the absence of incoördination. In one experiment, field cases fed substances high in vitamin A, recovered from the incoördination following treatment and regained the ability to walk and run. These clinically recovered cases presented spinal cord demyelination equally as severe as the controls that died.

Unpublished studies on several large series of rats have definitely shown that when large amounts of skim milk powder, rich in lysine and tryptophane, are included in yellow corn and skim milk powder rations, the renal degenerations fail to appear, but the spinal cord degenerations are not prevented.

The ration that is usually fed in attempts to produce incoördination in swine consists of 20% tankage, minerals and white corn or kaffir. It is definitely known that tankage has a low vitamin content. Furthermore, the proteins and carbohydrates have been definitely altered from a nutritional standpoint by the exposure to high heat during processing. The deleterious action of heat is illustrated when skim milk powder is autoclaved in order to destroy its B_1 content. When vitamin B_1 in the form of yeast is added to replace that destroyed in the heated skim milk powder the heat-treated skim milk powder plus vitamin B_1 is not as efficacious nutritionally as an equal amount of untreated skim milk powder. It was for this reason we substi-

[37] By H. E. Biester and D. F. Eveleth, Veterinary Research Institute, Iowa State College, Ames, Iowa.

tuted skim milk powder for tankage in subsequent experimentation in swine.

In one experiment, when brood sows or gilts were put on a ration consisting of 78% white corn, 20% skim milk powder and 2% minerals and salts seven months before breeding, a definite incoördination developed in the pigs. The picture also included scoliosis. The pigs ate more sparingly of the ration as time passed. Assay of the skim milk powder showed it very low in vitamin A. In order to stimulate the feed consumption, skim milk powder was fed ad libitum. The affected pigs made rapid improvement and rapid weight gains.

An analysis of our previous researches led us to the hypothesis that the rations used in the production of posterior incoördination were deficient, not only in vitamin A, but that they lacked some of the essential amino acids in which corn is deficient.

Discussion

The findings in this series of pigs fed the four experimental rations under dry lot conditions indicate that the protein factor and vitamin C are not directly responsible for the spinal cord demylination. On the basis of this experiment and previous investigations, the absence of vitamins A, B, D and E apparently are not the specific casual factors of this degenerative process. Some factor aside from the known vitamins is necessary to prevent demyelination. This factor is present in the green feeds.

The qualitative and quantitative character of the protein in the ration bears a relationship to the fatty degenerations found in the kidneys. The same factor appears to be responsible for the fatty degeneration present in the liver.

Several of the pigs on ration 4 (containing 50% skim milk powder) gained 1.2 pounds per day with an average of 1.1 for the group. Notwithstanding the rapid growth, the animals showed a slightly stilted gait. They lacked the finish or smoothness that should characterize a normal pig making these gains. Furthermore, the sex organs of male and females showed severe degenerative changes suggesting the inability to breed which was confirmed by the absence of conception. The myelin sheath degenerations occurred notwithstanding apparently adequate vitamins A, B, C, D, E and G intake. Some factor in addition to those mentioned is necessary for normal development. This factor, or factors, is present in the grasses or green stuffs. From a practical standpoint the results emphasize the well known but frequently neglected requirement of pasture or high grade alfalfa for the breeding stock and growing pigs. Until additional nutritional factors are studied and understood in this connection, we are inclined to interpret the myelin sheath degeneration as a general manifestation of malnutrition rather than a change due to a specific cause. The lack of green stuffs during the early life of the pig has a more serious effect than after the rapid growing period. Many unthrifty animals affected with low grade enteric diseases and parasites and parasites and are kept on constantly used dry lots suffer in part from nutritional disorders, notwithstanding the fact that they receive rations that are beyond criticism from the standpoint of minerals, carbohydrates, proteins and the known vitamins. When such animals are moved to clean pastures in an attempt to overcome the poor sanitation rapid improvement is often noted. To a great extent this improvement should be attributed to better nutrition. Pathological studies of such cases may be quite misleading unless a serious attempt is made to evaluate the influence of nutritional, bacterial and parasitic factors. The deficiencies that prevail during dry lot feeding cannot be overcome even by feeding cost prohibitive experimental rations. When the available farm feeds are fed with the object of making gains that are profitable, the effect of such deficiency may be exaggerated.

Our past experiences have shown that the worker in infectious diseases is greatly handicapped without cooperation from the field of nutrition. The practitioner likewise both in diagnosis and treatment is handicapped unless he evaluates fully not only the immediate effect of faulty nutrition but the basic influence of this factor as well.

Encephalomyelitis—Anthrax

The Omaha meeting of the A. V. M. A. was held in the midst of the worst outbreak of disease among farm horses since 1912, and the worst anthrax outbreak since 1926.

Starting in the Prairie Provinces of Canada about the first of August, encephalomyelitis, apparently of the virus type, spread rapidly into Minnesota and North Dakota and by the close of the meeting, was causing heavy losses in Iowa, Northern Missouri and Eastern Nebraska. Every newspaper contained accounts of such losses, as usual exaggerated by calling every ailment affecting a horse "the horse disease."

Two radio broadcasts on this subject were arranged under the auspices of the American Veterinary Medical Association, one by C. M. Haring of California, the other by A. T. Kinsley of Missouri. Both described the symptoms and lesions, discussed its cause and means for limiting its spread, urging horse owners to call their veterinarian at the first suspicion of the disease among horses and mules, and counseled them not to waste their money on the dozens of drug compounds, vaccines, serums, etc., now being urged upon them by druggists and medicine peddlers and by the fakers that have swarmed into the affected area for the harvest.

Under the circumstances, the broadcasts were most timely and were highly appreciated and widely advertised by the radio stations.

Anthrax, serious in much of Eastern South Dakota for two or three weeks prior to the meeting, had, by the time of the meeting, become widely disseminated over Iowa, affecting principally cattle, to a less degree horses, and in some instances, swine. It was causing considerable, though much less excitement among livestock owners than the horse disease. One radio broadcast by E. C. Jones of Nebraska was arranged by the association on this subject. It too was eagerly accepted by KMA, over which it was broadcast, and advertised in the announcements during the two days preceding the broadcast.

It Must Have Been a Couple of Other Fellows

Recently, in his sometimes delirious syndicated column, "New York Day by Day," O. O. McIntyre wrote:

"Albert Payson Terhune, dog breeder, says he has never seen or known anyone who had seen a mad dog."

Asked about the matter, Mr. Terhune states:

"I am 100% responsible for every statement I make; but I refuse to be held responsible for statements made irresponsibly about me by other persons. I have gone on record, repeatedly, as saying that rabies exists, though it is rare, and that many non-rabid dogs have been condemned and killed as rabid. That is my belief and experience . . . . . McIntyre is a fine chap, a brilliant writer, but this time he seems to have gotten me confused with someone else."

Certain dog publications that, in the past, have mis-quoted Mr. Terhune on the subject of rabies, might well take note of this statement of his belief and experience.

* * * *

Recording Experiences

Undoubtedly a great number of veterinarians who are keen observers and constantly seeking new knowledge in their practice, fail to reveal some of their findings to their colleagues.

It appears to me, whether or not we are gifted writers or possess oratorical ability, we should exchange ideas more among ourselves through our journals and meetings. I know there are many veterinarians, including myself, who wish further light in veterinary medicine. Questions come up in our practice every day. Let us assist each other, that we may progress that much faster. Is not the following a good saying to put in practice? "I shall pass through this world but once. Any good, therefore, that I can do, or any kindness that I can show to any human being, let me do it now. Let me not defer it, for I shall not pass this way again."

Dow City, Ia. W. B. REDMAN.

Vitamins and Distemper

VII. SUMMARY OF VARIOUS VITAMINS KNOWN AT PRESENT WITH RECENT DEVELOPMENTS WITH PARTICULAR REFERENCE TO DOGS

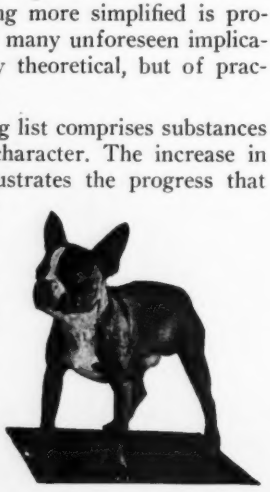
By W. O. FROHRING, Cleveland, Ohio

WHAT are vitamins? The constantly broadening scope of research in this field has resulted in some changes in the answer to this question. The following very satisfactory definition has been recently proposed[1]: "Vitamins are food constituents of organic origin, minute quantities of which have specific biological effects and lack of which in the food produces pathological disturbances, occasionally only under special conditions."

The frequency with which these "pathological disturbances" are confused with infectious diseases such as distemper or considered as after-effects of the infection, has been brought out in this study.

With many, the giving of vitamins A and D in the form of some fish liver oil is considered a complete fulfillment of the vitamin requirements. Yet, we know now that neither the series of deficiency disease nor the series of vitamins is exhausted with even the vitamins A, B, C, D, E, and G, which are more generally shown. Research in so-called qualitative nutrition instead of becoming more simplified is progressing towards many unforeseen implications of not only theoretical, but of practical importance.

THE following list comprises substances of vitamin character. The increase in their number illustrates the progress that has been made in vitamin research. Only those vitamins are listed whose biological function and existence now can be regarded as definitely established.[1]



Vitamins Known at the Present Time

FAT SOLUBLE VITAMINS

Having vitamin A activity (Antixerophthalmic):
- Pro-Vitamin A (Carotenes): Alpha Carotene; Beta Carotene; Gamma Carotene; Kryptoxanthin
- Vitamin A: Vitamin A as it usually occurs in fish liver oils having an absorption peak at 3280 Angstrom units.
- Vitamin A: Vitamin A activity found in other animal products not having an absorption peak at 3280 Angstrom units.

Vitamin D (D_2, D_3...) ..... Antirachitic
Vitamin E ..... Antisterility
Essential fatty acids ..... Unsaturated fatty acids
Vitamin K ..... Antihemorrhagic in chicks
Preventive factor for ..... Nutritional encephalomalacia
Preventive factor for ..... Myopathy in ducklings
Preventive factor for ..... Muscle dystrophy (observed in rabbits and guinea pigs on diet nutritionally satisfactory for rats.)

WATER SOLUBLE VITAMINS

Vitamin B (B_1) ..... Antiberiberi
Vitamin B_2 (G) complex:
1. Lactoflavin
2. B_6—anti-rat-acrodynia
3. P-P (Pellagra-Preventing) factor (Apparently identical with the factor which prevents "blacktongue" in dogs.)
4. Castle's extrinsic factor
5. Anti-pernicious-anemia
6. B_4
7. Anti-chicken-pellagra
8. Maturation factor for bone marrow

Vitamin C (Cibione, ascorbic acid) ..... Antiscorbutic
Vitamin G (See B_2 complex)
Vitamin P (Flavon) ..... Antipurpuric (?) (permeability)
Preventive factor for cataract (nutritional)

NEITHER FAT NOR WATER SOLUBLE

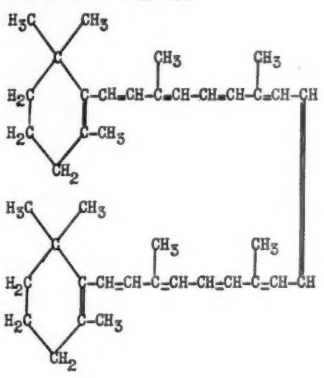
Vitamin H—Antiseborrheic, or anti-egg-injury factor

FAT SOLUBLE VITAMINS

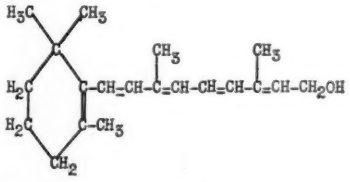
Vitamin A

The foregoing are roughly divided into two groups, namely—the fat soluble and water-soluble vitamins. In the beginning of vitamin research only "fat soluble A" was recognized. Later, the presence of vitamin D associated in some cases with vitamin A was discovered. Since the presence of vitamin A was determined by the biological effect of the substance in question it was not known until 1929[2] that the source of vitamin A activity of plants such as vegetables, grasses, fruits, etc., was carotene or pro-vitamin A, which is the precursor or mother substance of vitamin A. Four isomers of carotene are known, namely—alpha, beta, and gamma carotene, and kryptoxanthin. Beta carotene is used as the League of Nations' International standard for vitamin A.

Beta Carotene—$C_{40}H_{56}$



Vitamin A—$C_{20}H_{29}OH$



Note the similarity between the formula for vitamin A and the carotene formula. It has been suggested that the carotene molecule breaks down into two molecules of vitamin A, each of which takes up one molecule of water in the process.

Beta carotene is converted in the animal body to vitamin A. This conversion is believed to take place in the liver. The structural formulas for beta carotene and vitamin A are as follows:

Vitamin A, as found in fish liver oils, has an absorption peak at 3280 Angstrom units. There is some evidence that at least one isomer of vitamin A exists which has biological activity but which does not have an absorption peak at 3280 Å units. It appears to be in other animal products other than fish liver oils.[3]

Data on the requirements of the growing puppy for vitamin A and the manifestations of vitamin A deficiency in puppies are presented in No. II of this series (Veterinary Medicine, 32:76-82; February, 1937). The effects of vitamin A deficiency on young growing puppies are quite similar to those observed in other species of mammals. In most cases the experimental data in connection with the results of vitamin deficiencies are found in the literature, more comprehensively in connection with experimental animals than in clinical studies in man. This, of course, is due to the fact that most knowledge of the vitamins is obtained from studies with experimental animals in which synthetic diets are used. These methods are not applicable to clinical studies with human beings. In connection with vitamin A, however, the recent development of an instrument* and clinical test[4] for even mild degrees of vitamin A deficiency in children and adults may result in the clinical studies in man progressing beyond those of animal experiments. This new clinical test is based on the cooperation of the patient in indicating his response to see thresholds of light under standard conditions and, therefore, is not applicable to animals.

Carotene.—Carotene exists as four isomers, alpha, beta, gamma and kryptoxanthin. While each of these isomers may be demonstrated biologically to be precursors of vitamin A, it has not yet been determined by careful experiment whether or not their biological functions are identical

*The Bio-photometer (Frober-Faybor Co., Cleveland, Ohio).

or whether other biological functions in addition to furnishing the mother substance of vitamin A activity are furnished by one or more of these pro-vitamins.

Neither has it been established by long term experiments that the vitamin A produced by a species, such as the fish, from carotene is the complete substitute for the four carotene pro-vitamins when used as precursors of vitamin A by another species of animal.

Carotene has been demonstrated to be non-toxic even when given in large doses to several species of animals, while a voluminous literature indicates the toxicity of cod liver oil and other fish liver oils when given in substantial quantities to some species of animals. This toxic effect has been ascribed by Kawakami and Yamanoto[6] to three toxic substances in fish liver oils which they have isolated. That very pure vitamin A, as isolated from fish liver oils, may be toxic in itself, as contrasted with the non-toxic effect of carotene, has been demonstrated by Drigalski.[7]

Vitamin D

Probably the most publicized of all the vitamins is vitamin D. The antirachitic effect of vitamin D in relation to the similar effect of sunlight made it easy to capture the imagination of the public. Yet, the effect of vitamin D deficiency cannot be compared to the nutritional disasters that result from many other vitamin deficiencies. Very few quantitative data are available on the dog's requirements for vitamin D. While the requirements for vitamin D are naturally higher in the larger faster growing breeds, the dog's requirements are apparently quite modest for this vitamin. Private communication from an investigator in this field indicates that it is quite difficult, if not sometimes impossible regularly to produce experimental rickets in puppies, particularly in the smaller breeds, on diets deficient in vitamin D and essential mineral elements and, more especially, on a diet deficient in vitamin D alone.[5]

The sub-indices of D_2 and D_3 need little discussion here so far as the dog's requirements are concerned. The different forms of vitamin D are of importance primarily in relation to the quantitative requirements of different species of animals. Even fish liver oils may vary in the type of vitamin D present. Tuna liver oil, for instance, contains a different form of vitamin D than that which predominates in cod liver oil.

The quantitative requirements of the chick also are very much higher in terms of "rat units" when irradiated ergosterol is used as a source of vitamin D than when vitamin D from cod liver oil is used. In view of the dog's apparently modest requirements for vitamin D, the qualitative differences between the various forms of vitamin D are probably of little practical significance to the dog owner or the veterinarian.

Vitamin E

Vitamin E is at least one of the factors necessary for the prevention of sterility. While no extensive research has been conducted in connection with the dog's requirements for vitamin E, practical experience indicates that the administration of vitamin E concentrates is not always the simple solution to the problem of sterility. Vitamin E is rather widely distributed in foodstuffs. Even hydrogenated cottonseed oil still contains some vitamin E. It is found in largest amounts in such products as the oil of wheat germ and the fat of lettuce.

Essential Fatty Acids

These have been identified by Burr and Evans as unsaturated fatty acids such as linolenic and linolic. The need for these unsaturated fatty acids may be demonstrated by keeping rats on a diet completely free of fat. In about three or four months, growth is retarded; then usually the skin manifestations appear. These are oozing sores with spots covered with scabs. Other symptoms are loss of fur, (this, however, is not the only vitamin deficiency which causes loss of hair), and scaliness of the back of the hind legs with a scaly and necrotic tail. Atrophy of the sexual glands and very pronounced degenerative changes in kidneys were also noted. Death can be prevented and the animal restored to normal by adding to the diet small amounts of unsaturated fatty acids. It is interesting to note that cows' milk fat is

very poor in vitamin F while human milk fat is relatively high. No data are available on the amount of essential fatty acids in bitches' milk.

Potent sources of essential fatty acids are some plant fats, such as linseed oil and corn oil; also lard.

Vitamin K

The chick seems to be the most suitable experimental animal for studies in connection with vitamin K. Lack of vitamin K produces in the chick erosions of the gizzard. The almost uncoagulable blood results in a hemorrhagic diathesis with blood effusion and intramuscular hemorrhage as symptoms.

The richest sources of vitamin K are hog liver and alfalfa. Cod liver oil and butterfat are practically free of vitamin K. This vitamin is fortunately of little or no significance so far as the nutrition of the dog is concerned as diets free from vitamin K have been proved harmless for mammals.

Nutritional Encephalomalacia

The fat soluble factor which prevents nutritional encephalomalacia, like vitamin K, seems to be necessary only for the chick and not for mammals. This disease was first observed and studied by Goettsch and Pappenheimer and is unquestionably of nutritional origin. It is not infectious and it is also non-transmissible. It is produced in chicks only during the period in which there is active growth of the brain. It does not seem to be related to the sex or breed of the chick or to the body weight.

The factor is present in the non-saponifiable fraction of vegetable oils with the exception of olive oil. It resists heat, mild ultraviolet irradiation and aeration. If the proportion of lard in the diet is high it seems to hasten the development of the disease.

Myopathy

This occurs in ducklings under the same circumstances in which encephalomalacia is produced in chicks. Since these factors have not been chemically isolated it is not known whether or not they are identical. pigs, monkeys, and man, but not for the rat or the dog. The latter two species are

Muscle Dystrophy

This was first observed by Goettsch and Pappenheimer in rabbits and guinea pigs on a diet which is nutritionally satisfactory for rats.

Gyorgy[1] has reported that this active fat soluble vitamin is present in green leafy vegetables such as cabbage and lettuce. He also found it in alfalfa and wheat germ. Its concentration in these products, however, is relatively low.

Since milk and animal fats in general are poor sources of essential fatty acids and vitamin K as well as the factors which prevent encephalomalacia and muscle dystrophy, a higher nutritive value must be assigned to the fats of vegetables and to plant fats in general than has hitherto been assumed.

Vitamin Requirements Are Complex

From this outline of the fat soluble vitamins known at the present time it is obvious that a fish liver oil is not the complete answer to this problem, especially in some species of animals. The different requirements of different species is also again emphasized.

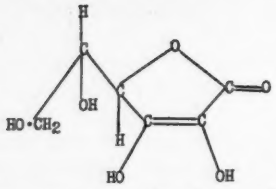
In a previous installment in which the symptoms in puppies on a vitamin A-free diet are described, (Veterinary Medicine 32: 190-95; April, 1937) it will be noted that skin lesions which have been ascribed to vitamin A deficiency by others appeared only in one litter of puppies out of the many litters that were depleted in vitamin A. While these skin lesions were cured by carotene dissolved in vegetable oils, it seems possible that these skin lesions may be due to a deficiency of a fat soluble vitamin other than vitamin A and may have been present in the fat used as a vehicle for the carotene used. Small amounts of vegetable fats other than the cottonseed oil were present.

THE WATER SOLUBLE VITAMINS

Vitamin C—The Antiscorbutic Vitamin

This is one of the few vitamins that has been isolated in pure crystalline form and has been identified chemically as ascorbic acid. The structural formula of vitamin C is given at the top of the next column.

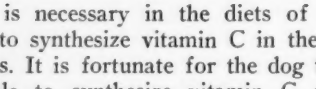
It has also been synthesized.



It is necessary in the diets of guinea able to synthesize vitamin C in their own bodies. It is fortunate for the dog that he is able to synthesize vitamin C as this vitamin which is very unstable to heat and oxidation combined is practically absent in all canned or dried dog foods. If it were not for the fact that the dog is able to synthesize this vitamin, scurvy would probably be the most common vitamin deficiency encountered in dogs.

Vitamin B_1

This vitamin has also been chemically identified and is now being synthesized on a commercial scale. The structural formula of vitamin B_1 is:



Vitamin B_1 Hydrochloride

Vitamin B_1 is the factor which prevents polyneuritis in pigeons and beriberi in man. The need for vitamin B_1 by the dog has been firmly established by Cowgill[8] who is using anorexia as the criterion of mild deficiency. He has reported data as to the dog's actual requirements for B_1.

The studies in B_1 deficiency in these experiments differed from those of Cogwill in that newly weaned puppies were used in the experiment herein reported while Cogwill used much older animals. As has also been noted in other vitamin experiments, the clinical picture is not exactly the same in the very young puppy as that obtained with older dogs.

The deficiency in very-young, newly-weaned puppies occurs more quickly and usually death occurs before the classical symptoms (other than anorexia) appear.

The Vitamin B_2 or G Complex

In order to avoid confusion in the mind of the reader, it must first be stated that the term "B_2" is used in Europe and the term "vitamin G" is used in this country to represent the same complex.

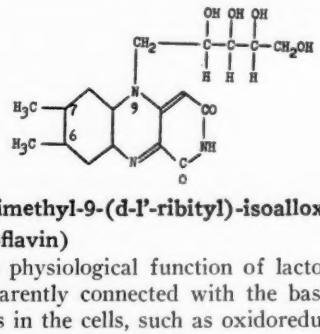
This complex may be regarded as having seven or more constituents as shown in the table (page 468), and which will be described briefly. Considerable research is necessary before the complete, clear-cut picture of this complex will be apparent.

Lactoflavin (Riboflavin)

In 1933 lactoflavin was isolated and identified by Gyorgy[9] as one of the pigments of milk and a component of B_2 or G complex.

Lactoflavin is a fluorescent green-yellow pigment. It is a component of the colored component of the chromophore group of Warburg's yellow enzyme. Lactoflavin and this enzyme are present in practically every cell and in all cell products. It, therefore, occurs in a cell product such as milk. The enzyme is a protein compound of lactoflavin phosphoric acid ester, the latter being active and the protein being merely a colloidal carrier. Lactoflavin is, therefore, not only a vitamin but a proferment.

The structural formula of lactoflavin is:



6.7 dimethyl-9-(d-l'-ribityl)-isoalloxazin (lactoflavin)

The physiological function of lactoflavin is apparently connected with the basic reactions in the cells, such as oxidoreduction, as well as glycolytic processes.

Lactoflavin deficiency in both rats and dogs results in a loss of hair which can be distinguished from the loss of hair in B_6 deficiency by the absence of a dermatitis. In rats in particular, this baldness takes the form of a pattern as distinguished from loss of hair from other causes. Lactoflavin is, of course, also necessary for growth in common with most of the other vitamins.

Vitamin B_6

A deficiency of this vitamin in rats shows up principally by a symmetrical dermatitis. There is also an edematous, scaly skin on the mouth, nose, paws, ears, and tail. In these experiments with dogs, dermatitis and scaly skin were noticed particularly on the paws. This was noticed in older dogs, but not in very young puppies. In these young puppies, death occurred before these classical symptoms appeared.

These skin manifestations led to the belief that they were essentially identical with those of pellagra in man. That the pellagra-preventing factor is separate and distinct has been shown by Birch and Gyorgy.[10] They have shown that the diet of pellagrins in the southern part of the United States is surprisingly high in B_6. Therefore, the so-called "rat pellagra" is separate and distinct from human pellagra and its apparent counterpart so-called "blacktongue" in dogs.

Castle's "Extrinsic Factor"

Castle's extrinsic factor is a food constituent belonging to the B_2 or G complex group which, by the interaction of a second intrinsic factor secreted by the normal stomach, can be converted into the preventive factor of pernicious anemia. The true preventive factor is stored in the liver and the liver treatment of pernicious anemia is based on this effect. Judging from the few reports of this condition in dogs, both Castle's extrinsic factor and the liver factor are probably by comparison with the other vitamins, of little importance to veterinarians and dog owners.

Vitamin B_4

The absence of this vitamin, as in the case of vitamin B_1, is also believed to be associated with symptoms of nerve lesions. Such disturbances, as incoördination and ataxia, are believed to be a result of the absence of vitamin B_4.

While the existence of vitamin B_4 has been questioned by some authors, the reality of its existence seems now to be established fairly well by the recent experimental contributions of Elvehjem and his associates. It has been observed that the nervous condition which is described in chicks having vitamin B_4 deficiency closely resembles the nervous condition that has been observed in the same species on a diet lacking in the fat soluble anti-encephalomalacia factor.

The Pellagra-Preventing Factor

As has previously been shown, this factor is separate and distinct from the other factors of the B_2 complex. It seems to be identical, or closely associated, with the so-called "blacktongue" preventing factor necessary for the dog. This has been discussed more fully in the blacktongue experiments included in this report.

"Chick Pellagra"

A ration which has been dry-heated and which in rats supports normal growth, produces in chicks characteristic lesions which are called "pellagra-like." This must be considered a separate factor of the B_2 complex as it is obviously different from B_6 or lactoflavin deficiency and is possibly different also from the factors which prevent pellagra in man and "blacktongue" in dogs.

Whether or not this factor is necessary for all mammals must await further biological research. That it is very probably necessary for rats has been shown by recent experiments of Lepkovsky and Jukes.[11]

Cataract-Preventing Factor

While cataract has been frequently observed by several investigators in rats which have been on a diet poor in the vitamin B_2 complex, and has been ascribed by them to a deficiency of lactoflavin, yet, Gyorgy has reported that he has seen only two or three cases of cataract out of many hundreds of rats deficient in lactoflavin. He did find, however, low values of reduction against the dyestuff dichlorophenolindophenol. This, under conditions which are not yet understood, is supposedly the first change in the metabolism of the eye lens which probably leads later to visible cataract.

Since food supplements high in the B_2 complex would afford complete protection against cataract if they were administered before the first alteration in the lens appeared, it seems safe to conclude that the factor preventing this nutritional cataract

is a constituent differing from all the other known components of the B_2 complex.

Flavon

This pigment is entirely different from lactoflavin. While more research is necessary before the vitamin character of flavon can be regarded as definitely established, clinical experiments have been reported in which it was found that a pigment which corresponds in chemical composition to a flavon was a reliable styptic when given orally and particularly intravenously, in hemorrhagic diseases of vascular origin.[12]

DETOXIFYING VITAMIN

Vitamin H

In this brief review the fat soluble and water soluble vitamins have been presented as two separate groups. Since vitamin H is apparently neither a fat nor water soluble vitamin, it has been left to the last for brief discussion.

Vitamin H differs also from the other essential food factors previously mentioned in that it cures a toxic reaction rather than a deficiency. Therefore, it may be considered a conditional detoxifying agent rather than a food constituent that is necessary in the diet under all circumstances.

The existence of this factor was reported first by Gyorgy[13] who found that when rats were given a diet complete in all the known vitamins, but when uncooked egg white was given as the sole source of protein, in about six weeks skin manifestations developed which may be classified as seborrheic-desquamative.

These experiments were produced also by Gyorgy[13] in dogs.

DISCUSSION

The foregoing has been presented as a very brief review of the present status of vitamins for two principal reasons.

The first is to emphasize the increasing complexity in this field and yet, the possibilities of great importance of many of these factors in solving many of the pathological conditions in dogs which, in the past, have been considered due to infections, and sometimes included under that all too comprehensively used term, "distemper."

The second reason for presenting this brief review is to emphasize that even though the experiments presented earlier in this series, required over 500 puppies and over four years' time, it represents at best only a very modest contribution towards the many problems in connection with the nutrition of the young puppy and the dog, which lie ahead.

References

1. Gyorgy, Paul, 1937. Address delivered at a Meeting of the Academy of Medicine at Kansas City, Mo., February 19, 1937.

2. Moore, T., 1929. "Vitamin A and Carotene," Parts I-IV, *23*:803, 1267, 1270.

3. Frohring, W. O., Seibert, H. F., and Tabor, J. M. (To be published).

4. Jeans, P. C., Blanchard, Evelyn and Zentmire, Zelma, 1937. "Dark Adaptation and Vitamin A. A New Photometric Technic," *J.A.M.A.*, 108:451.

5. Goldblatt, Harry, (Private Communication) —(Western Reserve University, Department of Pathology, Cleveland, Ohio).

6. Kawakami, Kozo and Yamamoto, 1935. Itsuo, Bllt. Inst. for Phys. Chem. Res., Tokyo, 13:1524-46.

7. Drigalski, von Wolf v., 1934. "Ueber Carotin-Vitamin A im menschlichen Körper," *Sonderabdruck aus Zeitschrift für Vitamin-forschung* 3:1. Drigalski, Wolf v., 1933. "Uber Schädigung Durch Vitamin A," *Klinische Wochenscrift*, 12:308. Drigalski, Wolf v. und Laubmann, Walter, 1933. "Uber Schädigungen Durch Vitamin A," 12:1171: July, 1933.

8. Cowgill, G. R., Rosenberg, H. A. & Rogoff, J., 1931. "Studies in Physiology of Vitamins; Some Observations of Effect of Administration of Anti-neuritic and Heat Stable Factors on Anorexia Characteristic of Lack of Vitamin B Complex," *Am. J. Physiol.* 96:372:1934.

9. Gyorgy, P., Kuhn, R. & Wagner-Jauregg, T., 1934. "Flavines and Flavoproteins as Vitamin B_2," *Zeitschrift f. Physiol. Chem.*, 223:241.

10. Birch, T. W., Gyorgy, P. & Harris, L. J., 1935. "The Vitamin B_2 Complex. Differentiation of the Anti-blacktongue and the 'P-P' Factors from Lactoflavin and Vitamin B_2 (So-called 'Rat Pellagra' Factor). Parts I-VI., *Biochem. J.*, 29:2830.

11. Lepkovsky, S., Jukes, T. H. and Krause, M. E., 1936. "The Multiple Nature, Third Factor of the Vitamin B Complex," *J. Biol. Chem.*, 115-557.

12. Armentano, L., Bentsáth, A., Beres, T. Ruszuyak, St. & Szent-Györgyi, A., 1936. "Effect of Substances of the Flavone Group on Capillary Permeability. Vitamin P," *Deutsch. med. Woch.*, 62:1325.

13. Gyorgy, P., 1935. "Metabolism and Immunity Relations of the Skin," Handbuch der Kinderheilkunde, 4th Ed., Vol. 10, Die Hantkrankheit., Berlin.